Singerman, Joel

From: Eaton, Daniel J (DEC) <daniel.eaton@dec.ny.gov>
Sent: Thursday, August 26, 2021 4:39 PM
To: Tsiamis, Christos
Cc: Garbarini, Doug; Singerman, Joel
Subject: FW: Agenda in question and answer format
Attachments: Citizens MGP_Responses qeustions on the 2021-08-27 Meeting Agenda.docx; Drawing Attachments.2021-08-26.pdf; Citizens Hydraulic Relief System Design - Background and Timeline.docx

Christos,

I understand you are returning from vacation to join us. Here is a copy of the agenda for the meeting tomorrow.

Dan

From: Eaton, Daniel J (DEC)
Sent: Thursday, August 26, 2021 4:02 PM
To: Garbarini.Doug@epamail.epa.gov; Singerman, Joel <Singerman.Joel@epa.gov>
Cc: Brown, Janet E (DEC) <janet.brown@dec.ny.gov>; Miller, John Y (DEC) <john.miller@dec.ny.gov>; Pat Van Rossem <patrick.vanrossem@nationalgrid.com>; michael.benoit@arcadis.com; Young, Terry W <terry.young2@arcadis.com>; 'jjalonzo@demaximis.com' <jjalonzo@demaximis.com>; stephen.raymond@gza.com; Daniel.amate@gza.com
Subject: Agenda in question and answer format

Doug,

Attached is a copy of the agenda for tomorrow's meeting augmented with answers to a number of the questions. Also attached is a summary of the design considerations for the hydraulic relief system and a group of figures and drawings referred to the in the answers on the agenda.

Looking forward to tomorrow's meeting.

Over the spring and summer a number of other packages of information have been shared to the EPA which contain information pertinent to the discussions. These are:

1) The October 2020 DEC CAG question responses
2) The May 2021 DEC Briefing Memo
3) July 2021 Arcadis memo that was previously provided to DEC

This is a very large group of files and I believe in the past has been provided over an FTP site. If you would like those documents set up on an FTP site again please let me know.

Thanks,

Dan

Agenda
USEPA-NYSDEC Meeting
Former Citizens Gas Works MGP Site/Public Place
Brooklyn, New York
Date and Time: August 27, 2021, 11 a.m. EST

In order to kick start the meeting, the agenda below has been augmented with answers an number of the questions

1. Introductions

2. Summary of Remedial Efforts at the Former Citizens Gas Works MGP Site
   Concise review of project schedule and accomplishments

3. Discussion of Recent or Planned Investigations
   - Investigations that were recently completed (e.g., February 2021 Grid sampling)
   - Public Place investigations (e.g., July 2021 Roux workplan)
   - Status of additional investigation at Parcel IV
   - Additional investigations and/or remediation planned by developers on Parcels I-III (if any)

4. Closure of the Sealed Bulkhead wall
   Approval of the design for the closure of the sealed bulkhead wall near the gas shaft / tunnel.

5. Groundwater Treatment/Hydraulic Relief
   - Completed work (e.g., five oil/water separators have been installed) **To date, approximately 690 linear feet of hydraulic relief piping and five of the planned six hydraulic relief manholes have been installed at the Site. The hydraulic relief manholes at the Citizens site are functionally equivalent to the oil-water separators that were installed at the Fulton site. Both structures include sumps for the removal of sediments and a mechanism for the removal of debris and other floatables (oil/grease, etc.) from the water collected by the system. In the case of the Citizens manholes, the removal mechanism for debris/floatables is a vortex-type hydrodynamic separator, whereas the oil-water separators at the Fulton site include a series of over-under weirs. The specific brand/model of hydrodynamic separator installed in each manhole (First Defense HC Stormwater Treatment Device, by Hydro International, Ltd.) was proposed by National Grid on December 3, 2019 and approved by USEPA on December 9, 2019. The oil-water separators at the Fulton site do not include any additional filtration/treatment processes beyond those noted above.**
   - Planned work (e.g., one more oil/water separators to be installed) **The remaining approximately 160 linear feet of hydraulic relief piping and final (sixth) manhole will be installed later this fall in conjunction with the completion of the bulkhead barrier wall at the existing gas transmission tunnel shaft on Parcel II of the Site. Each manhole can accommodate a peak flow rate of 18 cubic feet per second – roughly 18 times the design flow rate of the hydraulic relief piping connected to each manhole. These six manholes are more than sufficient to handle the flow conveyed by the hydraulic relief piping at the Site.**
   - Additional considerations/questions for discussion
     - Has the discharge from these systems been analyzed? If not already completed, should we consider collecting samples and evaluating the need to treat water collected in these systems prior to discharge (such as carbon treatment)? **The hydraulic relief system is not yet operational (it's not currently collecting water), so no sampling has been conducted to date. The primary purpose of the hydraulic relief system is to prevent structural damage to or excessive deflection of the bulkhead barrier wall system due to increases in groundwater mounding caused by future activities and conditions unrelated to the Citizens remediation project (e.g., Site development, climate change, etc.). Sampling of the treated water was not anticipated, nor was it**

requested by the agencies during the various review cycles of the hydraulic relief system design.

6. MGP Source Material Soil Removal
    - Completed work (e.g., several subsurface tar-contaminated MGP structures and their contents and heavily-contaminated soils surrounding the structures have been removed; some material removed from depths to 26 feet below ground surface) **Pre-Remediation NAPL Monitoring Program (December 2010-May 2019): Recovery of approximately 48,000 gallons of fluid (groundwater/DNAPL).**
    - **Site Remediation (July 2019-May 2021):**
        - **Parcel I (Block 471, Lot 1):**
            - **Excavation of approximately 32,800 in-situ cubic yards (cy) of material from depths of between approximately 14 feet and 26 feet below grade (see attached mark-up of Drawing C-103 [Site Remedial Excavation Plan]);**
            - **Removal of buried piping encountered during the excavation activities;**
            - **Installation of new recovery wells CGRW-08 through CGRW-12 (see attached Drawing C-109 [Site Restoration and Final Grading Plan]);**
            - **Fine grading and surface restoration for remedial excavation areas 1 through 4;**
            - **Off-Site recycling of approximately 2,270 tons of clean concrete;**
            - **Off-Site disposal of approximately 265 tons of non-regulated construction and demolition (C&D) debris;**
            - **Off-Site treatment/disposal of approximately 41,765 tons of impacted material; and**
            - **Off-Site treatment/disposal of approximately 154,135 gallons of construction wastewater.**
        - **Parcel II (Block 471, Lot 100):**
            - **Selective demolition of existing bulkheads and removal of approximately 3,695 cy of material from depths of between approximately 5 feet and 13 feet below grade (see attached mark-up of Drawing C-103 [Site Remedial Excavation Plan]);**
            - **Installation of approximately 470 linear feet of new bulkhead barrier wall (see attached Drawing S-103A [Site Bulkhead Barrier Wall Plan]);**
            - **Installation of approximately 290 linear feet of new hydraulic relief piping and three new hydraulic relief manholes/treatment units (MH-3, MH-5, and MH-6; see attached Drawings C-106 [Hydraulic Relief System Plan and Profile – Sta. 0+00 to Sta. 4+75], C-107 [Hydraulic Relief System Plan and Profile – Sta. 4+75 to Sta. 9+25], C-504 [Hydraulic Relief System Details], and C-505 [Hydraulic Relief System Details]);**
            - **Off-Site recycling of approximately 2,925 tons of clean concrete;**
            - **Off-Site disposal of approximately 1,490 tons of non-regulated C&D debris; and**
            - **Off-Site treatment/disposal of approximately 205 tons of impacted material.**
        - **Parcel III (Block 471, Lot 200):**
            - **Excavation of approximately 16,905 cy of material from depths of between approximately 4 feet and 21 feet below grade (see attached mark-up of Drawing C-103 [Site Remedial Excavation Plan]);**
            - **Removal of buried piping encountered during the excavation activities;**

        - **Installation of approximately 380 linear feet of new bulkhead barrier wall (see attached Drawing S-103A [Site Bulkhead Barrier Wall Plan]);**
        - **Installation of approximately 400 linear feet of new hydraulic relief piping and two new hydraulic relief manholes/treatment units (MH-1 and MH-2; see attached Drawing C-106 [Hydraulic Relief System Plan and Profile – Sta. 0+00 to Sta. 4+75], C-504 [Hydraulic Relief System Details], and C-505 [Hydraulic Relief System Details]);**
        - **Installation of two new temporary catch basins (CB-1 and CB-2; see attached Drawing C-106 [Hydraulic Relief System Plan and Profile – Sta. 0+00 to Sta. 4+75]);**
        - **Off-Site recycling of approximately 780 tons of clean concrete;**
        - **Off-Site treatment/disposal of approximately 22,990 tons of impacted material;**
        - **On-Site treatment/discharge of approximately 201,545 gallons of construction wastewater; and**
        - **Off-Site treatment/disposal of approximately 214,830 gallons of construction wastewater.**
    - Planned work (e.g., additional source removal on Parcel I in the vicinity of the former generator house, adjacent to the old brick sewer line that crosses the site and removal of contents of the former heavy oil pump pit [an intact subsurface reinforced concrete vault] and from areas adjacent to the foundation for the former pump house located on Parcel III **Completion of supplemental remedial excavation area in the vicinity of the former generator house on Parcel I of the Site ("Area 12"; see attached mark-up of Drawing C-103 [Site Remedial Excavation Plan]);**
    - **Installation of bulkhead barrier wall closure at the existing gas transmission tunnel shaft on Parcel II of the Site (see attached Drawings S-103A [Site Bulkhead Barrier Wall Plan], S-105A [Bulkhead Barrier Wall Plan – Sta. 2+25 to Sta. 4+75], S-202 [Bulkhead Barrier Wall Profile – Sta. 2+25 to Sta. 4+75], S-313 [Bulkhead Barrier Wall Sections], S-505 [Bulkhead Barrier Wall Details], and S-510 [Bulkhead Barrier Wall Details]);**
    - **Installation of bulkhead pile cap on Parcels II and III of the Site;**
    - **Installation of approximately 160 linear feet of remaining hydraulic relief piping and the final (sixth) hydraulic relief manhole/treatment unit (MH-4; see attached Drawings C-106 [Hydraulic Relief System Plan and Profile – Sta. 0+00 to Sta. 4+75], C-107 [Hydraulic Relief System Plan and Profile – Sta. 4+75 to Sta. 9+25], C-504 [Hydraulic Relief System Details], and C-505 [Hydraulic Relief System Details]);**
    - **Installation of six new recovery wells on Parcel II of the Site (CGRW-13 through CGRW-18) and eight new recovery wells on Parcel III of the Site (CGRW-19I, CGRW-19D, CGRW-20I, CGRW-20D, CGRW-21I, CGRW-21D, CGRW-22I, and CGRW-22D; see attached Drawing C-109 [Site Restoration and Final Grading Plan]);**
    - **Installation of four new piezometers on Parcel II of the Site (CGPZ-07 through CGPZ-10) and two new piezometers on Parcel III of the Site (CGPZ-11 and CGPZ-12; see attached Drawing C-109 [Site Restoration and Final Grading Plan]); and**
    - **Completion of fine grading and surface restoration activities for remedial excavation area 12 on Parcel I of the Site and along the new bulkhead barrier wall on Parcels II and III of the Site.**
- **The contents of the former heavy oil pump pit and surrounding soils on Parcel III of the Site were removed in May 2021.**
- Future Activities:
    - **Preparation of Interim Site Management Plans and Construction Completion Reports;**
    - **Initiation of Site-wide operation, monitoring, and maintenance program, including NAPL monitoring/recovery;**

- **Installation of Site-wide soil cover system by property owners/developers in conjunction with future redevelopment projects; and**
- **Preparation of Final Site Management Plans and Final Engineering Reports.**

- Additional considerations/questions for discussion
  - Discussion of GEI RI (2007 borings) and Arcadis supplemental design investigation (2016)
  - February 2021 National Grid borings, and Roux Associates 2021 investigation work plan-DEC indicated that developers had expressed an interest in doing additional investigations to determine if and where development may encounter any remaining contamination that may require remediation/management in accordance with the SMP
  - Are RPs/developers considering any additional removal or ISS work?
  - Are there any areas near canal or near north or south boundaries where ISS might be worthwhile? **See responses under Agenda Item No. 5 below.**

7. Tar Recovery/Migration Controls
   - Completed work (e.g., passive recovery wells) **Five of the planned 19 new passive DNAPL recovery wells have been installed on Parcel I of the Site (CGRW-08 through CGRW-12).**
   - Planned work (e.g., additional passive recovery wells, including wells near Huntington Street) **The 14 remaining passive DNAPL recovery wells (CGRW 13 through CGRW-18, CGRW-19I, CGRW-19D, CGRW-20I, CGRW-20D, CGRW-21I, CGRW-21D, CGRW-22I, and CGRW-22D), including those located near Huntington Street, will be installed later this year in conjunction with the Site restoration activities.**
   - Additional considerations/questions for discussion
     - How will the selection of locations of wells near Huntington Street be made? **In general, the proposed locations and screened intervals/depths of the recovery wells (including those to be installed near Huntington Street) are based on a number of factors, including: (1) the horizontal and vertical distribution of DNAPL-saturated soils (i.e., soils containing potentially recoverable DNAPL) on Parcels II and III, as identified during previous Site investigations; (2) DNAPL monitoring/recovery data for former high-producing recovery wells that were decommissioned at the beginning of the Site remediation work (e.g., CGRW-07I, CGRW-07D, CGRW-05D, etc.); and (3) the results of the DNAPL transmissivity evaluations conducted as part of the 2015 supplemental design investigation. Soil intervals containing DNAPL lenses, blebs, globs, or coatings were generally not considered given the limited potential for DNAPL recovery. Screened intervals may be adjusted in the field based on the subsurface conditions observed during the well drilling operations. Similarly, proposed well locations may be shifted if DNAPL-saturated intervals are not observed during well drilling operations.**
     - Would it be worthwhile to build in some redundancy by adding a wing wall or doing ISS in areas? **DNAPL transmissivity testing conducted at monitoring wells CGMW-41I and CGMW-43D and at recovery well CGRW-06I during the SDI showed a low potential for recoverability indicating that, where present, DNAPL in soil is relatively immobile (Arcadis 2016). Moreover, a review of existing data at the eastern (Parcel II) and southwestern (Parcel III) edges of the Site shows that DNAPL-saturated soils are limited in both horizontal and vertical extent in these areas, and generally are not present above elevation -40 feet NAVD88 (i.e., within the design requirements for the bulkhead barrier wall). ISS is similarly ill-suited for the Site given the depth/vertical distribution of DNAPL-saturated intervals and significant foundations that remain in the shallow zone, most of which are supported by timber piles that extend even deeper. The alignment of the existing Bond-Lorraine Street sewer (a nominal 72-inch diameter pile-supported combined sewer) at the northeast end of Parcel II also poses constructability challenges for**

both a wing wall and ISS in that area. In general, known areas of excavatable (or ISS-able) MGP source material are already addressed by the remedy.

- Will the SMP include a section that is specific to the removal of NAPL from the passive recovery wells? **The final SMP will include protocols for DNAPL monitoring and recovery (e.g., monitoring frequency, management/disposal of recovered DNAPL, criteria for completion NAPL recovery operations, etc.).**
- While not being prescriptive, can the SMP provide specific direction as to how removal of NAPL from the recovery wells should be performed to reduce odors and exposures for those that might be using the property post development? **The SMP can include general protocols/best practices to mitigate fugitive odors during DNAPL monitoring/recovery operations.**

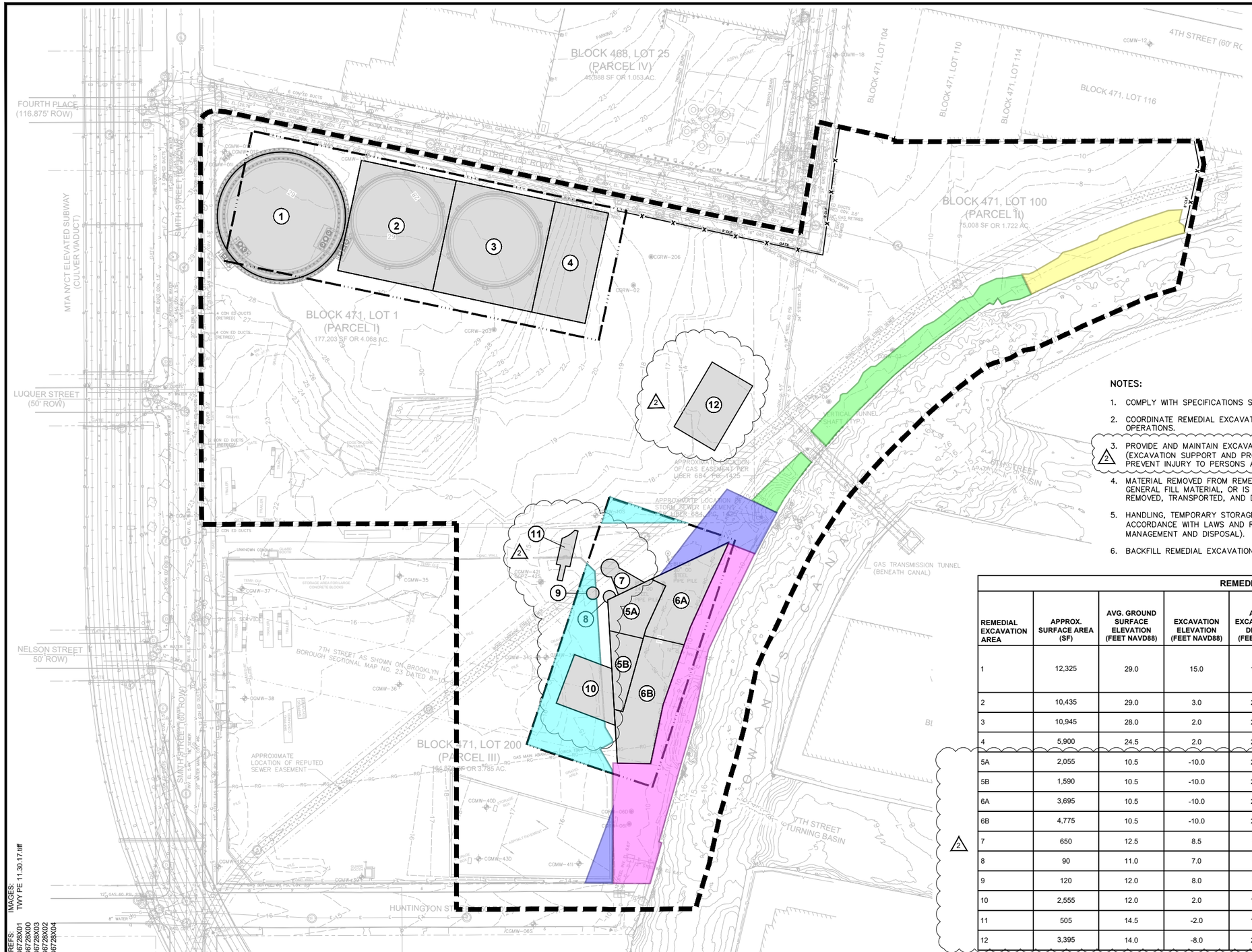
8. Vapor Intrusion
   - Completed work (e.g., removal of MGP source materials; NAPL recovery)
   - Planned work (e.g., SMP will require evaluation of potential for vapor intrusion and mitigation measures; NYCOER's practice is to require vapor barriers on all new construction).
   - Additional considerations/questions for discussion
     - Rather than just identify that other evaluations or programs might require VI evaluations or measures, can we be more proactive and require or work with developers to ensure barriers and/or piping are included in the design of any new buildings?
     - Measures required for the Con Ed cleanup on 18th Street

- **Regarding the remedial elements for the W. 18th OU3 site the element #2 stated that a subsurface barrier wall will be installed around the site on three sides. The original plan was to utilize a jet-grout wall around the perimeter. The actual barrier wall constructed consisted of water-tight (sealed with Adeka P-200) sheet pile walls that keyed into a clay layer approximately 35 feet below ground surface around 2 ½ sides of the perimeter. The remaining barrier wall utilized the existing grout wall and sheet pile from an adjacent building as the other 1 ½ sides of the perimeter. The method for connecting the new sheet pile to the existing grout wall and sheet pile was through the use of a grout tie-in wall. This grout tie-in wall was simply five 6-inch diameter overlapping borings that extended into the same clay layer and "connected" the site sheeting with the existing grout wall and sheet pile.**
-
- **At the Citizens site the sheetpile were installed to an elevation of -40' (which is approximately 42 feet below ground surface) over approximately 880 linear feet. As shown in multiple investigations the tar at depth is discontinuous in areal extent and in varying quantities making the method of grouting at the bottom of the entire wall infeasible and unnecessary.**
-
- **The remedial element #3 stated that the subsurface floor and walls of the new building would be isolated from the remaining contamination, using a mud slab on the floor and waterproofing on the floor and walls. First, a mud slab is essentially just that – a layer of concrete with no reinforcement. The primary purpose is on projects with high water tables (the bottom basement slab in this case was 8-9 feet below the water table) the use of the mud slab establishes a working platform to maintain the structural integrity at the base of the building footings, and a stable surface for installing waterproofing membrane. It is not used for remedial purposes even though it could be viewed that way. The original plan was to install a 2-foot thick mud slab on the floor, but that was changed to a 6-inch slab with 18 inches of clean material underneath. The vapor/waterproofing was then placed over the slab and up the outside of the foundation walls, and the basement floor poured over the top of this membrane.**
-
- **At the Citizens site there isn't a shallow water table on the western portion of the site but the foundations could come close on the eastern portion (closer to the canal). Most new**

commercial construction includes this vapor/waterproofing membrane already, but, if not, could easily be requested at a minimal cost to the developer.

-

9. Request by Members of CAG for USEPA to Evaluate Citizens/Public Place to Calculate a Hazard Ranking Score
   - HRS evaluation of remediated site?



SUPPLEMENTAL EXCAVATION LEGEND:

****ALL EXCAVATION LIMITS ARE APPROXIMATE****

- ADDITIONAL EXCAVATION TO APPROX. 5 FEET BELOW GRADE TO FACILITATE SELECTIVE DEMOLITION OF EXISTING PARCEL II BULKHEAD
- ADDITIONAL EXCAVATION TO APPROX. 13 FEET BELOW GRADE TO FACILITATE SELECTIVE DEMOLITION OF EXISTING PARCEL II BULKHEAD
- ADDITIONAL EXCAVATION TO APPROX. 8-10 FEET BELOW GRADE TO FACILITATE INSTALLATION OF ANCHORS/TIE RODS FOR NEW PARCEL III BULKHEAD BARRIER WALL
- ADDITIONAL EXCAVATION TO APPROX. 6-7 FEET BELOW GRADE TO FACILITATE INSTALLATION OF ANCHORS/TIE RODS FOR NEW PARCEL III BULKHEAD BARRIER WALL
- ADDITIONAL EXCAVATION TO APPROX. 5 FEET BELOW GRADE TO FACILITATE INSTALLATION OF TEMPORARY FABRIC STRUCTURE FOR PARCEL III REMEDIAL EXCAVATION WORK

LEGEND:

- REMEDIAL EXCAVATION AREA (APPROXIMATE)
- (3) AREA IDENTIFIER
- CONCEPTUAL LIMIT OF TEMPORARY FABRIC STRUCTURE(S) — 5 / C-502

NOTES:

1. COMPLY WITH SPECIFICATIONS SECTION 31 23 00 (EXCAVATION AND FILL).
2. COORDINATE REMEDIAL EXCAVATION AND BACKFILLING OPERATIONS WITH SELECTIVE DEMOLITION AND PILE DRIVING OPERATIONS.
3. PROVIDE AND MAINTAIN EXCAVATION PROTECTION SYSTEM(S) IN ACCORDANCE WITH SPECIFICATIONS SECTION 31 50 00 (EXCAVATION SUPPORT AND PROTECTION), DRAWINGS S-101, S-102, AND S-108, AND LAWS AND REGULATIONS TO PREVENT INJURY TO PERSONS AND PROPERTY, INCLUDING SURFACE STRUCTURES AND UNDERGROUND FACILITIES.
4. MATERIAL REMOVED FROM REMEDIAL EXCAVATION AREAS THAT DOES NOT COMPLY WITH THE REQUIREMENTS FOR GENERAL FILL MATERIAL, OR IS IN EXCESS OF THE QUANTITY REQUIRED FOR GENERAL FILL MATERIAL, SHALL BE REMOVED, TRANSPORTED, AND DISPOSED OF AWAY FROM THE SITE, UNLESS OTHERWISE APPROVED BY ENGINEER.
5. HANDLING, TEMPORARY STORAGE, TRANSPORTATION, AND DISPOSAL OF REMEDIAL EXCAVATION WASTE SHALL BE IN ACCORDANCE WITH LAWS AND REGULATIONS AND SPECIFICATIONS SECTION 02 60 05 (CONTAMINATED WASTE MANAGEMENT AND DISPOSAL).
6. BACKFILL REMEDIAL EXCAVATION AREAS TO THE SUBGRADE ELEVATIONS SHOWN OR INDICATED ON DRAWING C-108.

REMEDIAL EXCAVATION SCHEDULE

REMEDIAL EXCAVATION AREA	APPROX. SURFACE AREA (SF)	AVG. GROUND SURFACE ELEVATION (FEET NAVD88)	EXCAVATION ELEVATION (FEET NAVD88)	AVG. EXCAVATION DEPTH (FEET BGS)	ESTIMATED EXCAVATION VOLUME (CY)	APPROX. DEPTH OF EXISTING MATERIAL POTENTIALLY SUITABLE FOR REUSE AS GENERAL FILL MATERIAL (FEET BGS)	ESTIMATED VOLUME OF EXISTING MATERIAL POTENTIALLY SUITABLE FOR REUSE AS GENERAL FILL MATERIAL (CY)	BACKFILL MATERIAL
1	12,325	29.0	15.0	14.0	6,445	0.0 - 10.0	875	CLSM / GENERAL FILL MATERIAL (SEE DRAWING S-101)
2	10,435	29.0	3.0	26.0	9,975	0.0 - 8.0	1,525	GENERAL FILL MATERIAL
3	10,945	28.0	2.0	26.0	11,725	0.0 - 8.0	1,130	GENERAL FILL MATERIAL
4	5,900	24.5	2.0	22.5	4,450	0.0 - 8.0	750	GENERAL FILL MATERIAL
5A	2,055	10.5	-10.0	20.5	1,565	--	0	GENERAL FILL MATERIAL
5B	1,590	10.5	-10.0	20.5	1,270	--	0	GENERAL FILL MATERIAL
6A	3,695	10.5	-10.0	20.5	2,810	--	0	GENERAL FILL MATERIAL
6B	4,775	10.5	-10.0	20.5	3,975	--	0	GENERAL FILL MATERIAL
7	650	12.5	8.5	4.0	100	--	0	GENERAL FILL MATERIAL
8	90	11.0	7.0	4.0	15	--	0	GENERAL FILL MATERIAL
9	120	12.0	8.0	4.0	20	--	0	GENERAL FILL MATERIAL
10	2,555	12.0	2.0	10.0	950	--	0	GENERAL FILL MATERIAL
11	505	14.5	-2.0	16.5	310	--	0	GENERAL FILL MATERIAL
12	3,395	14.0	-8.0	22.0	2,770	--	0	GENERAL FILL MATERIAL

XREFS: 36728X01 36728X00 36728X03 36728X02 36728X04
IMAGES: TWY PE 11.30.17.tiff

50' 0 50' 100'
1"=50'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	7/29/2021	ADDED SUPPLEMENTAL REMEDIAL EXCAVATION AREAS ON PARCELS I AND III AND UPDATED SCHEDULE	MJB	MJB
1	2/4/2019	ADDED APPROX. DEPTHS AND EST. VOLUMES OF REUSE MATERIAL	APG	MJB

Professional Engineer's Name: **TERRY W. YOUNG**
Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	11/30/2017	MJB
Designed by: APG	Drawn by: MJW	Checked by: MJB

DRAFT
NOT FOR CONSTRUCTION

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NATIONAL GRID USA • BROOKLYN, NEW YORK
FORMER CITIZENS GAS WORKS MANUFACTURED GAS PLANT SITE
CARROLL GARDENS/PUBLIC PLACE
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

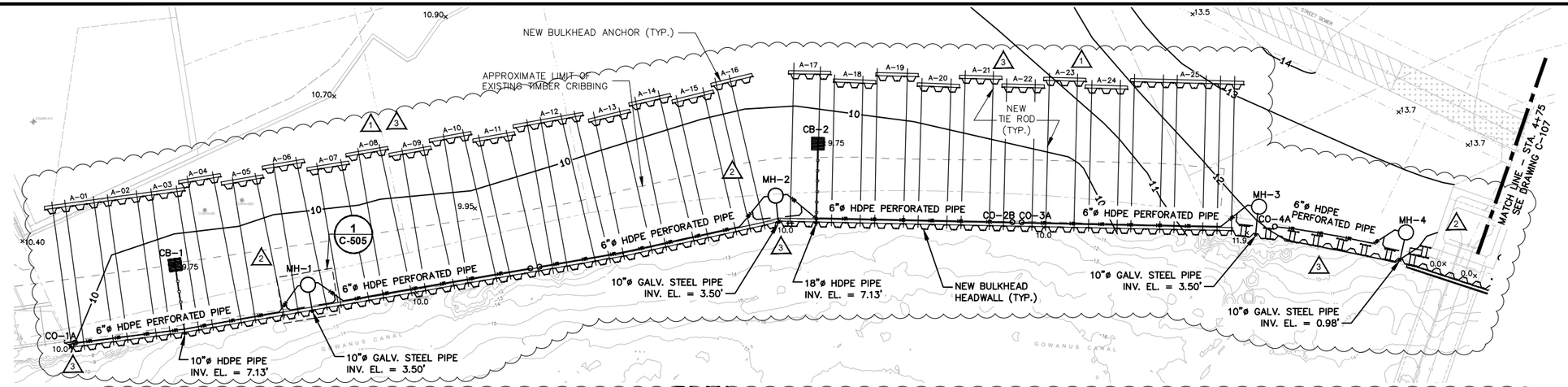
SITE REMEDIAL EXCAVATION PLAN

Arcadis Project No.
B0036728.0001.00003

Date
NOVEMBER 2017

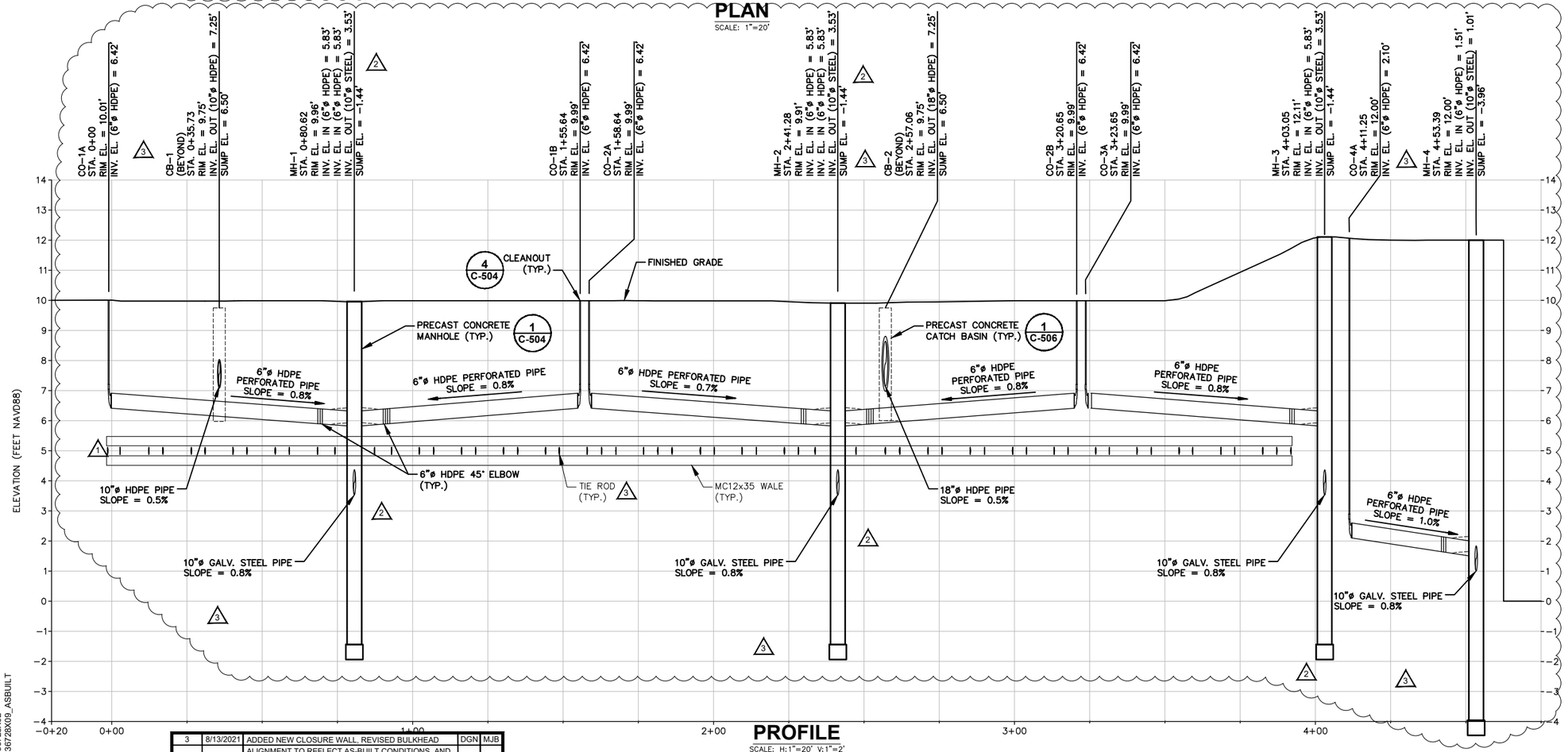
Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
Syracuse, NY 13202
Tel. 315.446.9120

C-103



PLAN

SCALE: 1"=20'



PROFILE

SCALE: H: 1"=20' V: 1"=2'

LEGEND:

- 10 — FINAL GRADE TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
- ×9.75 — FINAL GRADE SPOT ELEVATION
- HR — HR — NEW HYDRAULIC RELIEF LINE
- NEW STORM SEWER LINE
- MH-1 — NEW MANHOLE (1 C-504)
- CO-1B — NEW CLEANOUT (4 C-504)
- CB-1 — NEW CATCH BASIN (1 C-506)

XREFS:
36728X00
36728X01
36728X03ALTERNATE
36728X04
36728X08
36728X02
36728X09_ASBUILT

IMAGES:
Arcadis Logo BW_2021.PNG
LAB PE 11.30.17.tiff
LAB PE 2.4.19.tiff
TWY PE 11.30.17.tiff

0 20' 40'
HORIZONTAL SCALE: 1"=20'
0 2' 4'
VERTICAL SCALE (10x EXAGGERATED): 1"=2'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
3	8/13/2021	ADDED NEW CLOSURE WALL, REVISED BULKHEAD	DGN	MJB
		ALIGNMENT TO REFLECT AS-BUILT CONDITIONS, AND		
		REVISED FINAL GRADE CONTOURS		
2	1/10/2020	REVISED PIPING ALIGNMENT AT MANHOLES, ADDED	DGN	MJB
		ADDITIONAL MANHOLE, AND REVISED STRUCTURE		
		LABELS		
1	2/4/2019	REVISED BULKHEAD ANCHORS TO REFLECT NEW	RPK	MJB
		DESIGN		

Professional Engineer's Name: **TERRY W. YOUNG**
Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	11/30/2017	MJB
Designed by	Drawn by	Checked by
JSB	MJW	BRT

STATE OF NEW YORK · TERRY WILLIAM YOUNG · LICENSED PROFESSIONAL ENGINEER · 074847

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FORMER CITIZENS GAS WORKS MANUFACTURED GAS PLANT SITE
CARROLL GARDENS/PUBLIC PLACE
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

HYDRAULIC RELIEF SYSTEM PLAN AND PROFILE STA. 0+00 TO STA. 4+75

Arcadis Project No.
B0036728.0001.00003

Date
NOVEMBER 2017

Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
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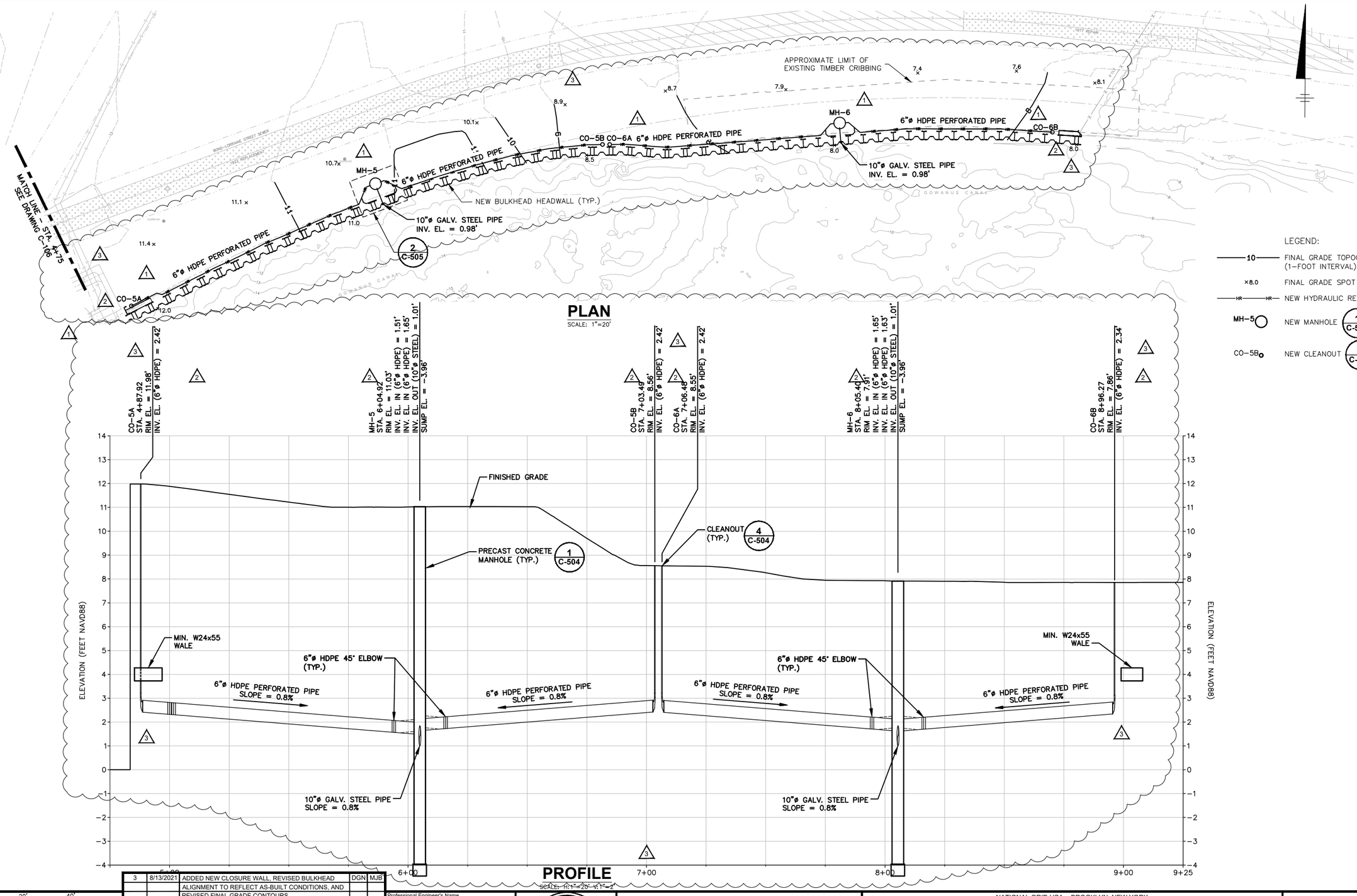
Tel. 315.446.9120

C-106



LEGEND:

- 10 — FINAL GRADE TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
- ×8.0 — FINAL GRADE SPOT ELEVATION
- HR—HR — NEW HYDRAULIC RELIEF LINE
- MH-5 — NEW MANHOLE (1 / C-504)
- CO-5B — NEW CLEANOUT (4 / C-504)

IMAGES:
Arcadis Logo BW_2021.PNG
LAB PE 11.30.17.tiff
LAB PE 2.4.19.tiff
TWY PE 11.30.17.tiff

XREFS:
36728X00
36728X01
36728X03ALTERNATE
36728X04
36728X08
36728X02
36728X09_ASBUILT

HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE (10x EXAGGERATED): 1"=2'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
3	8/13/2021	ADDED NEW CLOSURE WALL, REVISED BULKHEAD ALIGNMENT TO REFLECT AS-BUILT CONDITIONS, AND REVISED FINAL GRADE CONTOURS	DGN	MJB
2	11/13/2020	UPDATED BULKHEAD TERMINATIONS AND REVISED LOCATIONS OF CLEANOUTS CO-5A AND CO-5B	DGN	MJB
1	1/10/2020	REVISED PIPING ALIGNMENT AT MANHOLES, LOWERED EL. OF HYDRAULIC RELIEF PIPING, AND REVISED STRUCTURE LABELS	DGN	MJB

Professional Engineer's Name: TERRY W. YOUNG
Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	11/30/2017	MJB
Designed by	Drawn by	Checked by
JSB	MJW	BRT

STATE OF NEW YORK · TERRY WILLIAM YOUNG · 074847 · LICENSED PROFESSIONAL ENGINEER

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CARROLL GARDENS/PUBLIC PLACE
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

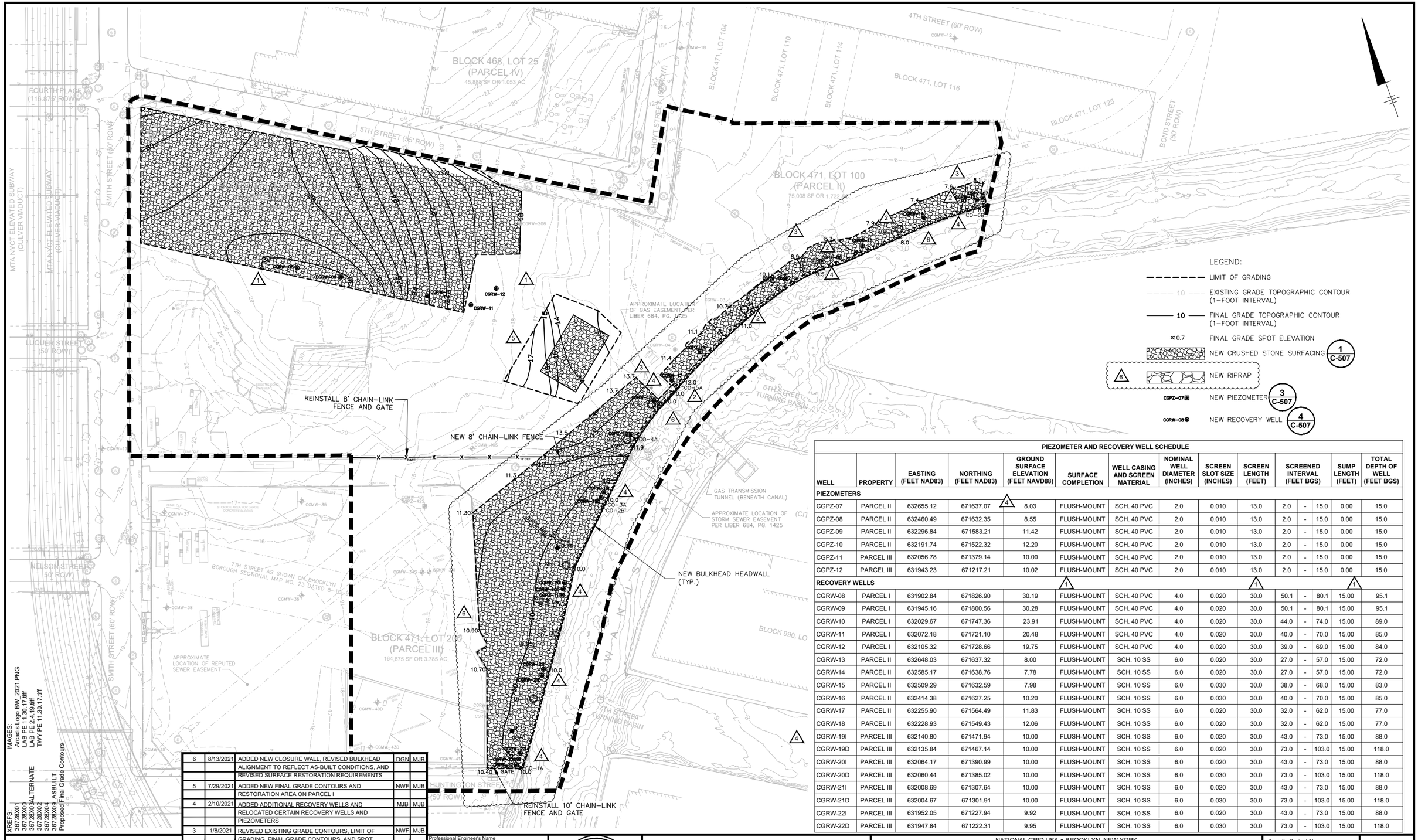
HYDRAULIC RELIEF SYSTEM PLAN AND PROFILE STA. 4+75 TO STA. 9+25

Arcadis Project No.
B0036728.0001.00003

Date
NOVEMBER 2017

Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
Syracuse, NY 13202
Tel. 315.446.9120

C-107



LEGEND:

- LIMIT OF GRADING
- 10 EXISTING GRADE TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
- 10 FINAL GRADE TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
- ×10.7 FINAL GRADE SPOT ELEVATION
- NEW CRUSHED STONE SURFACING (1 / C-507)
- 6 NEW RIPRAP
- CGPZ-07 NEW PIEZOMETER (3 / C-507)
- CGRW-08 NEW RECOVERY WELL (4 / C-507)

PIEZOMETER AND RECOVERY WELL SCHEDULE

WELL	PROPERTY	EASTING (FEET NAD83)	NORTHING (FEET NAD83)	GROUND SURFACE ELEVATION (FEET NAVD88)	SURFACE COMPLETION	WELL CASING AND SCREEN MATERIAL	NOMINAL WELL DIAMETER (INCHES)	SCREEN SLOT SIZE (INCHES)	SCREEN LENGTH (FEET)	SCREENED INTERVAL (FEET BGS)			SUMP LENGTH (FEET)	TOTAL DEPTH OF WELL (FEET BGS)
PIEZOMETERS														
CGPZ-07	PARCEL II	632655.12	671637.07	8.03	FLUSH-MOUNT	SCH. 40 PVC	2.0	0.010	13.0	2.0	-	15.0	0.00	15.0
CGPZ-08	PARCEL II	632460.49	671632.35	8.55	FLUSH-MOUNT	SCH. 40 PVC	2.0	0.010	13.0	2.0	-	15.0	0.00	15.0
CGPZ-09	PARCEL II	632296.84	671583.21	11.42	FLUSH-MOUNT	SCH. 40 PVC	2.0	0.010	13.0	2.0	-	15.0	0.00	15.0
CGPZ-10	PARCEL II	632191.74	671522.32	12.20	FLUSH-MOUNT	SCH. 40 PVC	2.0	0.010	13.0	2.0	-	15.0	0.00	15.0
CGPZ-11	PARCEL III	632056.78	671379.14	10.00	FLUSH-MOUNT	SCH. 40 PVC	2.0	0.010	13.0	2.0	-	15.0	0.00	15.0
CGPZ-12	PARCEL III	631943.23	671217.21	10.02	FLUSH-MOUNT	SCH. 40 PVC	2.0	0.010	13.0	2.0	-	15.0	0.00	15.0
RECOVERY WELLS														
CGRW-08	PARCEL I	631902.84	671826.90	30.19	FLUSH-MOUNT	SCH. 40 PVC	4.0	0.020	30.0	50.1	-	80.1	15.00	95.1
CGRW-09	PARCEL I	631945.16	671800.56	30.28	FLUSH-MOUNT	SCH. 40 PVC	4.0	0.020	30.0	50.1	-	80.1	15.00	95.1
CGRW-10	PARCEL I	632029.67	671747.36	23.91	FLUSH-MOUNT	SCH. 40 PVC	4.0	0.020	30.0	44.0	-	74.0	15.00	89.0
CGRW-11	PARCEL I	632072.18	671721.10	20.48	FLUSH-MOUNT	SCH. 40 PVC	4.0	0.020	30.0	40.0	-	70.0	15.00	85.0
CGRW-12	PARCEL I	632105.32	671728.66	19.75	FLUSH-MOUNT	SCH. 40 PVC	4.0	0.020	30.0	39.0	-	69.0	15.00	84.0
CGRW-13	PARCEL II	632648.03	671637.32	8.00	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	27.0	-	57.0	15.00	72.0
CGRW-14	PARCEL II	632585.17	671638.76	7.78	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	27.0	-	57.0	15.00	72.0
CGRW-15	PARCEL II	632509.29	671632.59	7.98	FLUSH-MOUNT	SCH. 10 SS	6.0	0.030	30.0	38.0	-	68.0	15.00	83.0
CGRW-16	PARCEL II	632414.38	671627.25	10.20	FLUSH-MOUNT	SCH. 10 SS	6.0	0.030	30.0	40.0	-	70.0	15.00	85.0
CGRW-17	PARCEL II	632255.90	671564.49	11.83	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	32.0	-	62.0	15.00	77.0
CGRW-18	PARCEL II	632228.93	671549.43	12.06	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	32.0	-	62.0	15.00	77.0
CGRW-19I	PARCEL III	632140.80	671471.94	10.00	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	43.0	-	73.0	15.00	88.0
CGRW-19D	PARCEL III	632135.84	671467.14	10.00	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	73.0	-	103.0	15.00	118.0
CGRW-20I	PARCEL III	632064.17	671390.99	10.00	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	43.0	-	73.0	15.00	88.0
CGRW-20D	PARCEL III	632060.44	671385.02	10.00	FLUSH-MOUNT	SCH. 10 SS	6.0	0.030	30.0	73.0	-	103.0	15.00	118.0
CGRW-21I	PARCEL III	632008.69	671307.64	10.00	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	43.0	-	73.0	15.00	88.0
CGRW-21D	PARCEL III	632004.67	671301.91	10.00	FLUSH-MOUNT	SCH. 10 SS	6.0	0.030	30.0	73.0	-	103.0	15.00	118.0
CGRW-22I	PARCEL III	631952.05	671227.94	9.92	FLUSH-MOUNT	SCH. 10 SS	6.0	0.020	30.0	43.0	-	73.0	15.00	88.0
CGRW-22D	PARCEL III	631947.84	671222.31	9.95	FLUSH-MOUNT	SCH. 10 SS	6.0	0.030	30.0	73.0	-	103.0	15.00	118.0

IMAGES:
Arcadis Logo BW_2021.PNG
LAB PE 11.30.17.tiff
LAB PE 2.4.19.tiff
TWY PE 11.30.17.tiff

XREFS:
36728X01 Proposed_Final Grade Contours
36728X02
36728X04
36728X09_ASBUILT
36728X00
36728X03ALTERNATE

No.	Date	Revisions	By	Ckd
6	8/13/2021	ADDED NEW CLOSURE WALL, REVISED BULKHEAD ALIGNMENT TO REFLECT AS-BUILT CONDITIONS, AND REVISED SURFACE RESTORATION REQUIREMENTS	DGN	MJB
5	7/29/2021	ADDED NEW FINAL GRADE CONTOURS AND RESTORATION AREA ON PARCEL I	NWF	MJB
4	2/10/2021	ADDED ADDITIONAL RECOVERY WELLS AND RELOCATED CERTAIN RECOVERY WELLS AND PIEZOMETERS	MJB	MJB
3	1/8/2021	REVISED EXISTING GRADE CONTOURS, LIMIT OF GRADING, FINAL GRADE CONTOURS, AND SPOT ELEVATIONS ON PARCEL II	NWF	MJB
2	1/10/2020	ADDED ADDITIONAL MANHOLE AND REVISED STRUCTURE LABELS	DGN	MJB
1	11/18/2019	REVISED PARCEL I RECOVERY WELL DETAILS TO REFLECT AS-BUILT CONDITIONS	APG	MJB

50' 0 50' 100'
1"=50'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

Professional Engineer's Name
TERRY W. YOUNG
Professional Engineer's No.
074847

State	Date Signed	Project Mgr.
NY	11/30/2017	MJB
Designed by NWF/MJB	Drawn by MJW	Checked by SAP

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CARROLL GARDENS/PUBLIC PLACE
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

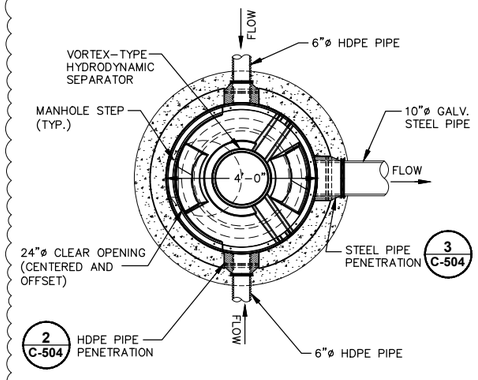
SITE RESTORATION AND FINAL GRADING PLAN

Arcadis Project No.
B0036728.0001.00003

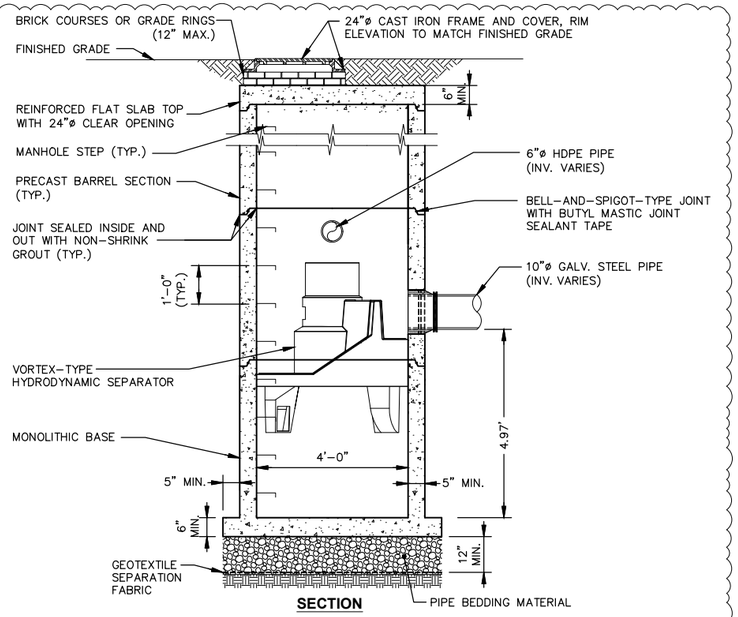
Date
NOVEMBER 2017

Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
Syracuse, NY 13202
Tel. 315.446.9120

C-109



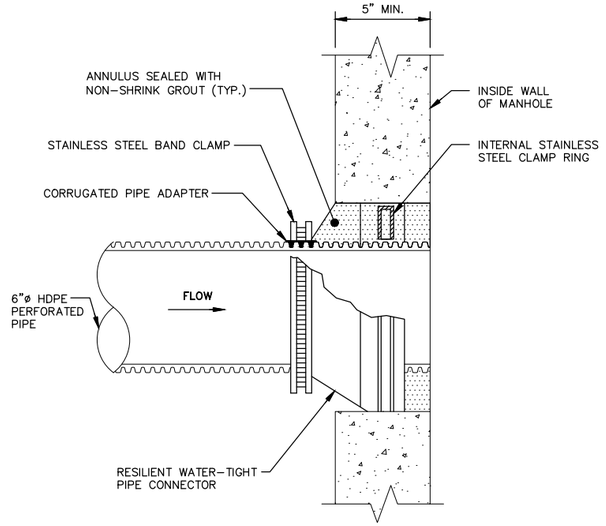
PLAN



SECTION

TYPICAL PRECAST CONCRETE MANHOLE 1

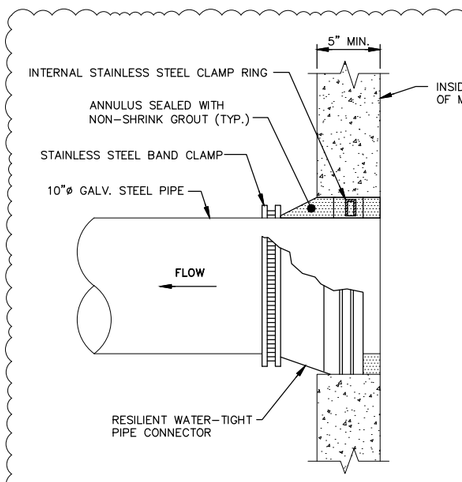
SCALE: 1/2" = 1'-0"



SECTION

TYPICAL HDPE PIPE PENETRATION AT MANHOLE 2

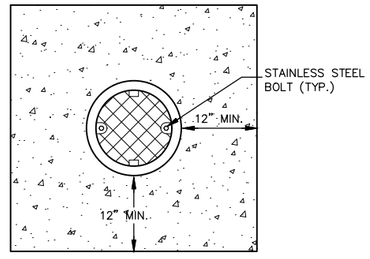
SCALE: 3" = 1'-0"



SECTION

TYPICAL STEEL PIPE PENETRATION AT MANHOLE 3

SCALE: 2" = 1'-0"



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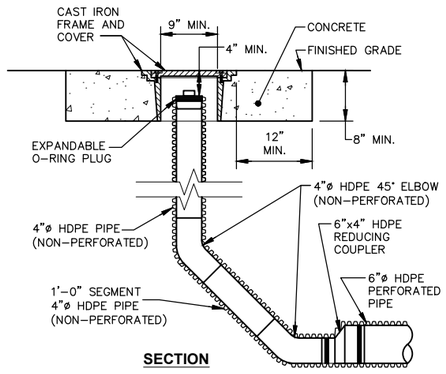
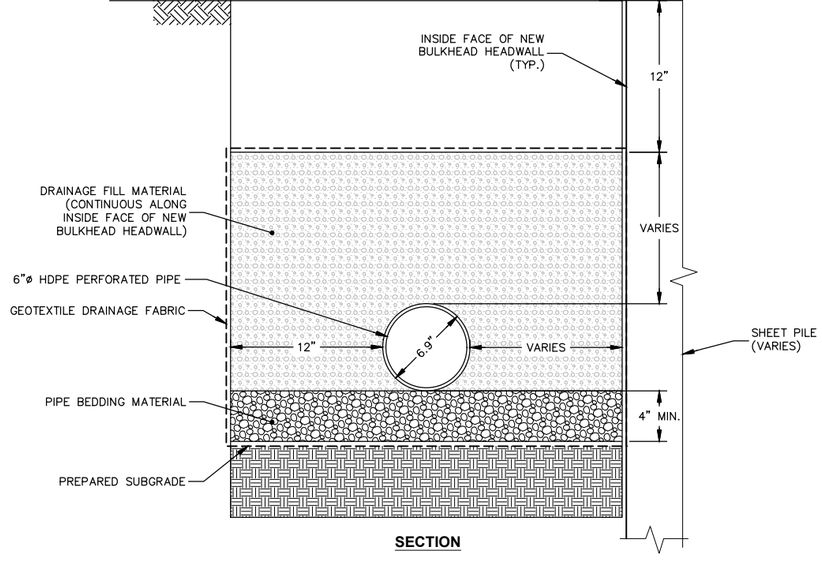


SECTION

TYPICAL CLEANOUT 4

SCALE: 1" = 1'-0"



SECTION

TYPICAL PIPE TRENCH FOR HYDRAULIC RELIEF PIPING 5

SCALE: 2" = 1'-0"

CITY: SYRACUSE, NY DIV/GROUP: ENVCAD DB: B GETTS, B DECLERQ, L POSENAUER, J. HARRIS
C:\Users\mwasilewski\BIM 360\Arcadis\ANA - National Grid\Project Files\FORMER CITIZENS GAS WORKS MGP SITE\2020\30004014\01-DWG\36728_C-504.dwg LAYOUT: C-504 SAVED: 1/12/2020 6:09 PM PLOTSTYLETABLE: ---- PLOTTED: 1/12/2020 6:11 PM BY: WASILEWSKI, MATT
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SCALE AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
1	1/10/2020	REVISED DETAILS 1 AND 3 TO REFLECT CHANGES TO HYDRAULIC RELIEF SYSTEM	DGN	MJB

Professional Engineer's Name: TERRY W. YOUNG
Professional Engineer's No.: 074847
State: NY
Date Signed: 11/30/2017
Project Mgr.: MJB
Designed by: JSB
Drawn by: MJW
Checked by: BRT

STATE OF NEW YORK TERRY WILLIAM YOUNG LICENSED PROFESSIONAL ENGINEER 074847

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BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

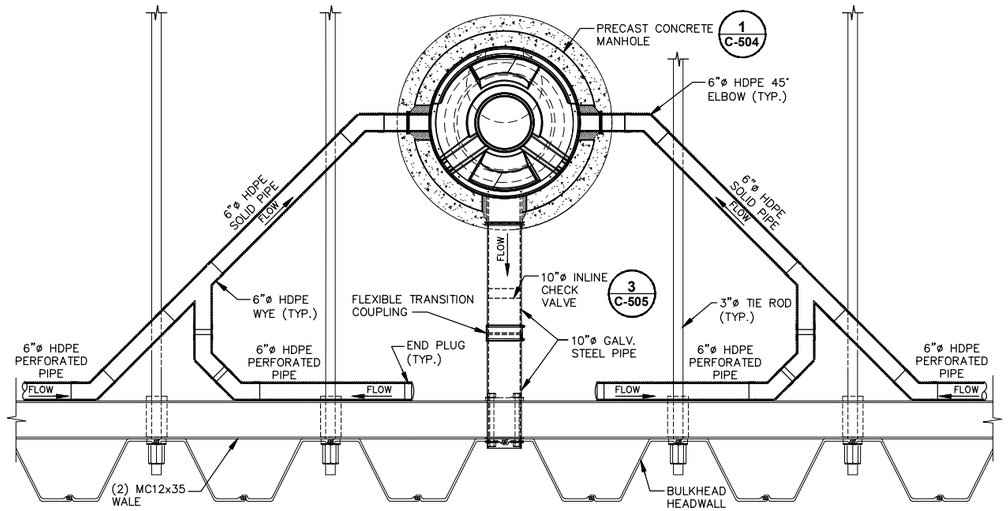
HYDRAULIC RELIEF SYSTEM DETAILS

Arcadis Project No.
B0036728.0001.00003

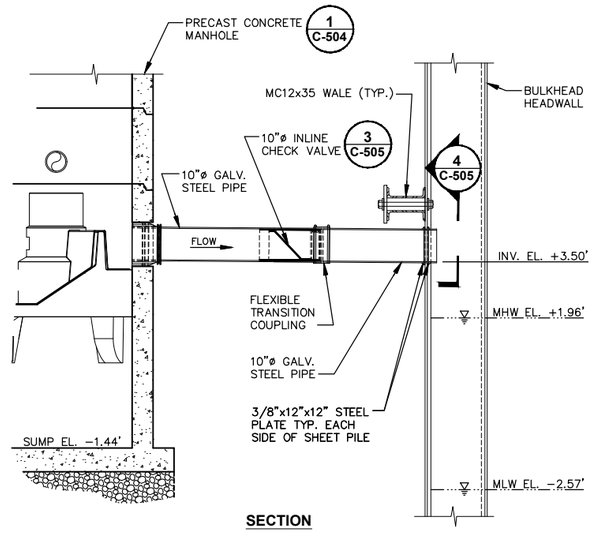
Date
NOVEMBER 2017

Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
Syracuse, NY 13202
Tel. 315.446.9120

C-504



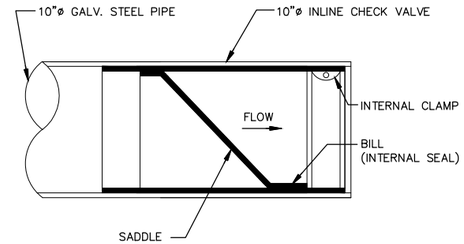
PLAN



SECTION

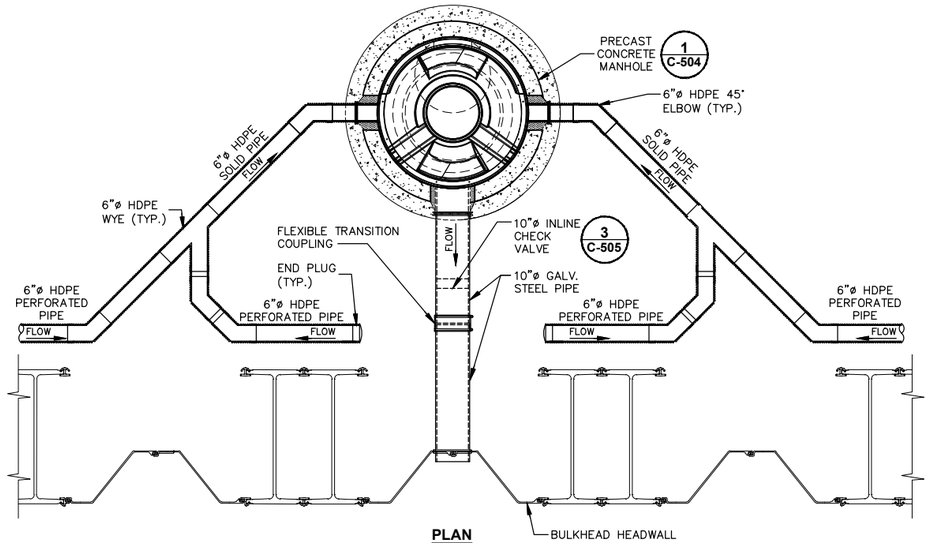
TYPICAL STEEL PIPE CONNECTION AT ANCHORED TIEBACK WALL 1

SCALE: 1/2" = 1'-0"



INLINE CHECK VALVE 3

SCALE: 2" = 1'-0"



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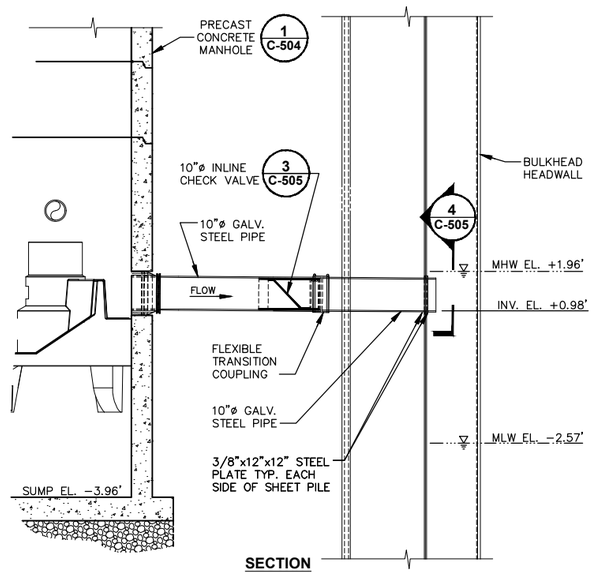
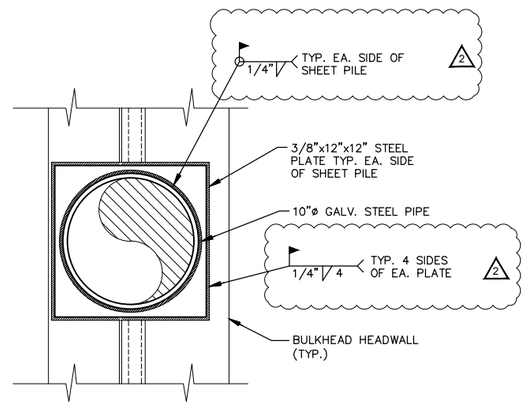


SECTION

TYPICAL STEEL PIPE CONNECTION AT CANTILEVERED COMBINATION WALL 2

SCALE: 1/2" = 1'-0"



TYPICAL STEEL PIPE PENETRATION AT BULKHEAD 4

SCALE: 2" = 1'-0"

CITY: SYRACUSE, NY DIV/GROUP: ENVCAD DB: B GETTS, B DECLERQ, L POSENAUER, J. HARRIS
C:\Users\jharris\BIM 360\Arcadis\ANA - National Grid\Project Files\FORMER CITIZENS GAS WORKS MGP SITE\2020\300040141\01-DWG\36728_C-505.dwg LAYOUT: C-505 SAVED: 11/13/2020 5:50 PM PLOTSTYLETABLE: --- PLOTTED: 11/16/2020 6:37 AM BY: HARRIS, JESS
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36728X00

SCALE AS INDICATED

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
2	11/13/2020	CORRECTED WELD REQUIREMENTS IN DETAIL 4	LAB	MJB
1	1/10/2020	REVISED DETAILS 1 AND 2 TO REFLECT CHANGES TO HYDRAULIC RELIEF SYSTEM	RPK	MJB

Professional Engineer's Name: TERRY W. YOUNG
Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	11/30/2017	MJB
Designed by: JSB	Drawn by: MJW	Checked by: BRT

STATE OF NEW YORK · TERRY WILLIAM YOUNG · LICENSED PROFESSIONAL ENGINEER · 074847

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CARROLL GARDENS/PUBLIC PLACE
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

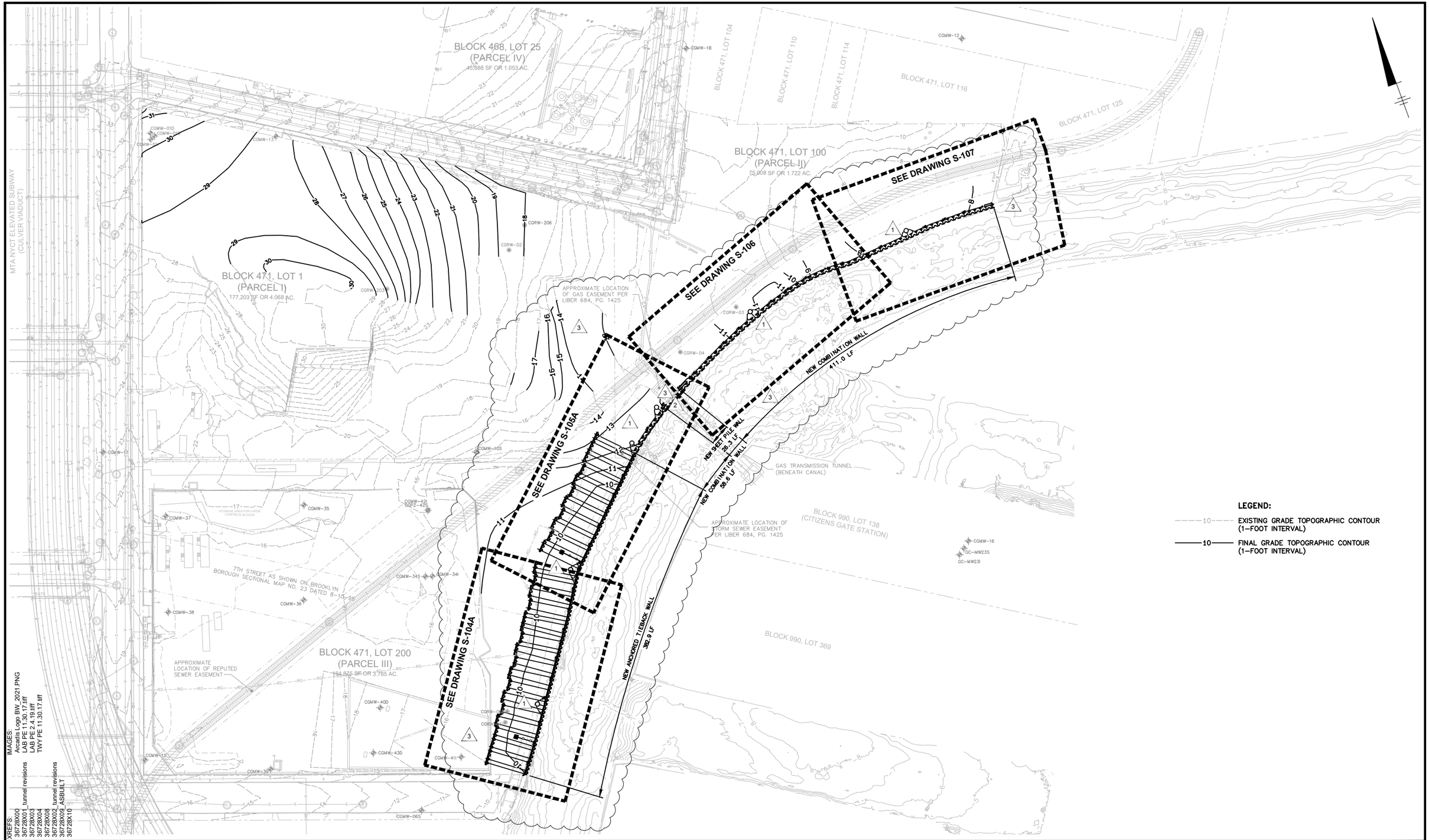
HYDRAULIC RELIEF SYSTEM DETAILS

Arcadis Project No.
B0036728.0001.00003

Date
NOVEMBER 2017

Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
Syracuse, NY 13202
Tel. 315.446.9120

C-505



LEGEND:

10 EXISTING GRADE TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)

10 FINAL GRADE TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)

XREFS:
36728X00 IMAGES:
36728X01 Arcadis Logo BW_2021.PNG
36728X03 LAB PE 11.30.17.tiff
36728X04 LAB PE 2.4.19.tiff
36728X08 TWY PE 11.30.17.tiff
36728X02_tunnel revisions
36728X09_ASBUILT
36728X10

50' 0 50' 100'
1"=50'

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
3	8/13/2021	ADDED NEW CLOSURE WALL, REVISED BULKHEAD	MSG	MJB
		ALIGNMENT TO REFLECT AS-BUILT CONDITIONS, AND		
		REVISED FINAL GRADE CONTOURS		
2	4/13/2020	REVISED BULKHEAD TERMINATION AT TUNNEL SHAFT	DGN	MJB
1	1/10/2020	REVISED PIPING ALIGNMENT AT MANHOLES AND	DGN	MJB
		ADDED ADDITIONAL MANHOLE		

Professional Engineer's Name
TERRY W. YOUNG
Professional Engineer's No.
074847

State	Date Signed	Project Mgr.
NY	2/4/2019	MJB
Designed by	Drawn by	Checked by
RPK	JLH	APC

STATE OF NEW YORK · TERRY WILLIAM YOUNG · LICENSED PROFESSIONAL ENGINEER · 074847

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FORMER CITIZENS GAS WORKS MANUFACTURED GAS PLANT SITE
CARROLL GARDENS/PUBLIC PLACE
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

SITE BULKHEAD BARRIER WALL PLAN

Arcadis Project No.
B0036728.0001.00003

Date
FEBRUARY 2019

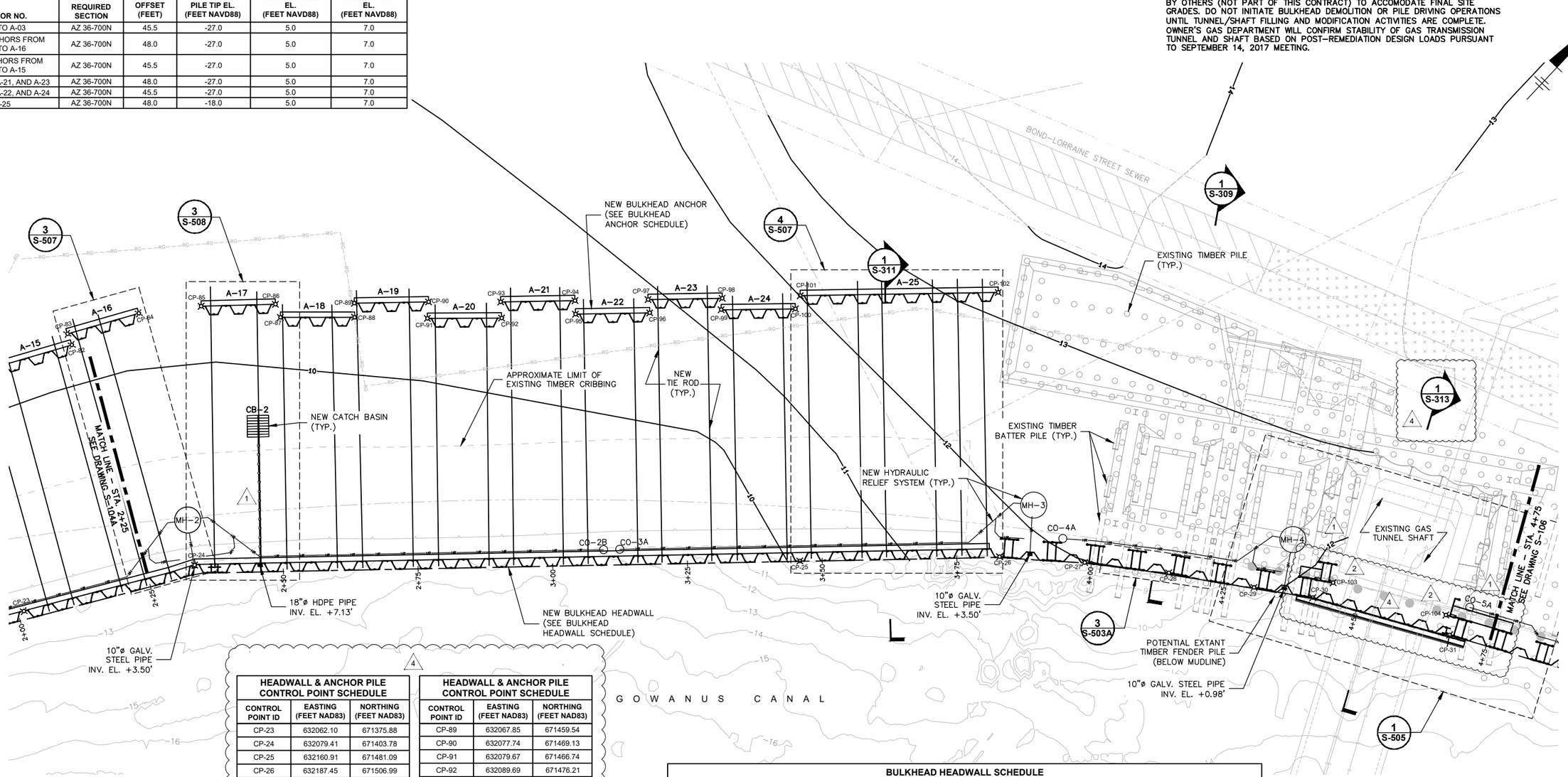
Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
Syracuse, NY 13202
Tel. 315.446.9120

S-103A

BULKHEAD ANCHOR SCHEDULE					
ANCHOR NO.	REQUIRED SECTION	ANCHOR OFFSET (FEET)	MIN. SHEET PILE TIP EL. (FEET NAVD88)	TIE ROD/WALE EL. (FEET NAVD88)	PILE CUT-OFF EL. (FEET NAVD88)
A-01 TO A-03	AZ 36-700N	45.5	-27.0	5.0	7.0
EVEN ANCHORS FROM A-04 TO A-16	AZ 36-700N	48.0	-27.0	5.0	7.0
ODD ANCHORS FROM A-05 TO A-15	AZ 36-700N	45.5	-27.0	5.0	7.0
A-17, A-19, A-21, AND A-23	AZ 36-700N	48.0	-27.0	5.0	7.0
A-18, A-20, A-22, AND A-24	AZ 36-700N	45.5	-27.0	5.0	7.0
A-25	AZ 36-700N	48.0	-18.0	5.0	7.0

NOTE:

1. EXISTING GAS TRANSMISSION TUNNEL AND SHAFT TO BE FILLED AND MODIFIED BY OTHERS (NOT PART OF THIS CONTRACT) TO ACCOMODATE FINAL SITE GRADES. DO NOT INITIATE BULKHEAD DEMOLITION OR PILE DRIVING OPERATIONS UNTIL TUNNEL/SHAFT FILLING AND MODIFICATION ACTIVITIES ARE COMPLETE. OWNER'S GAS DEPARTMENT WILL CONFIRM STABILITY OF GAS TRANSMISSION TUNNEL AND SHAFT BASED ON POST-REMEDIATION DESIGN LOADS PURSUANT TO SEPTEMBER 14, 2017 MEETING.



HEADWALL & ANCHOR PILE CONTROL POINT SCHEDULE		
CONTROL POINT ID	EASTING (FEET NAD83)	NORTHING (FEET NAD83)
CP-23	632062.10	671375.88
CP-24	632079.41	671403.78
CP-25	632160.91	671481.09
CP-26	632187.45	671506.99
CP-27	632199.73	671516.98
CP-28	632212.43	671526.28
CP-29	632225.82	671535.08
CP-30	632235.07	671541.14
CP-31	632258.34	671553.44
CP-82	632034.87	671418.05
CP-83	632032.85	671419.00
CP-84	632039.92	671430.83
CP-85	632047.47	671439.71
CP-86	632057.29	671449.38
CP-87	632059.62	671448.25
CP-88	632069.67	671457.67

HEADWALL & ANCHOR PILE CONTROL POINT SCHEDULE		
CONTROL POINT ID	EASTING (FEET NAD83)	NORTHING (FEET NAD83)
CP-89	632067.85	671459.54
CP-90	632077.74	671469.13
CP-91	632079.67	671466.74
CP-92	632089.69	671476.21
CP-93	632087.52	671478.28
CP-94	632097.43	671487.86
CP-95	632099.20	671486.10
CP-96	632109.11	671495.68
CP-97	632107.18	671497.28
CP-98	632117.09	671506.85
CP-99	632118.39	671505.17
CP-100	632128.35	671514.69
CP-101	632127.32	671517.11
CP-102	632153.75	671542.64
CP-103	632235.94	671545.75
CP-104	632255.30	671555.65

BULKHEAD HEADWALL SCHEDULE							
WALL ALIGNMENT FROM	WALL ALIGNMENT TO	LENGTH OF WALL (LF)	WALL TYPE	REQUIRED SECTION	MIN. SHEET PILE TIP EL. (FEET NAVD88)	MIN. KING PILE TIP EL. (FEET NAVD88)	PILE CUT-OFF EL. (FEET NAVD88)
CP-20	CP-25	345.9	ANCHORED TIEBACK WALL	AZ 42-700N	-43.0	--	10.0
CP-25	CP-26	37.1	ANCHORED TIEBACK WALL	AZ 46-700N	-43.0	--	12.0
CP-26	CP-27	15.8	COMBINATION WALL	HZ 1180M C M-26 / AZ 19-700	-40.0	-83.0	12.0
CP-27	CP-30	42.8	COMBINATION WALL	HZ 1180M D M-26 / AZ 19-700	-40.0	-83.0	12.0
CP-30	CP-31	26.3	SHEET PILE WALL	AZ 26-700	-21.5	--	0.0
CP-31	CP-38	168.5	COMBINATION WALL	HZ 1180M D M-26 / AZ 19-700	-40.0	-83.0	12.0

LEGEND:

- 10 — FINAL GRADE TOPOGRAPHIC CONTOUR (1-FOOT INTERVAL)
- NEW SHEET PILE
- NEW KING PILE
- CP-31 — PILE CONTROL POINT
- NEW MC12 DOUBLE WALE

XREFS:
36728X00
36728X01_tunnel revisions
36728X03
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36728X02_tunnel revisions
36728X09_ASBUILT
36728X10

IMAGES:
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TWY PE 11.30.17.tiff

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1"=10' (10' 0 10' 20')

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING: USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd
4	8/13/2021	ADDED NEW CLOSURE WALL AND REVISED BULKHEAD ALIGNMENT TO REFLECT AS-BUILT CONDITIONS	MSG	MJB
3	7/22/2020	REVISED HEADWALL TRANSITION AT CP-38	DGN	MJB
2	4/13/2020	REVISED BULKHEAD TERMINATION AT TUNNEL SHAFT	DGN	MJB
1	1/10/2020	REVISED PIPING ALIGNMENT AT MANHOLES, ADDED ADDITIONAL MANHOLE, AND REVISED STRUCTURE LABELS	DGN	MJB

Professional Engineer's Name: TERRY W. YOUNG
Professional Engineer's No.: 074847
State: NY | Date Signed: 2/4/2019 | Project Mgr.: MJB
Designed by: RPK | Drawn by: JLH | Checked by: APC

STATE OF NEW YORK · TERRY WILLIAM YOUNG · 074847 · LICENSED PROFESSIONAL ENGINEER

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CARROLL GARDENS/PUBLIC PLACE
BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

BULKHEAD BARRIER WALL PLAN STA. 2+25 TO STA. 4+75

Arcadis Project No.
B0036728.0001.00003

Date
FEBRUARY 2019

Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
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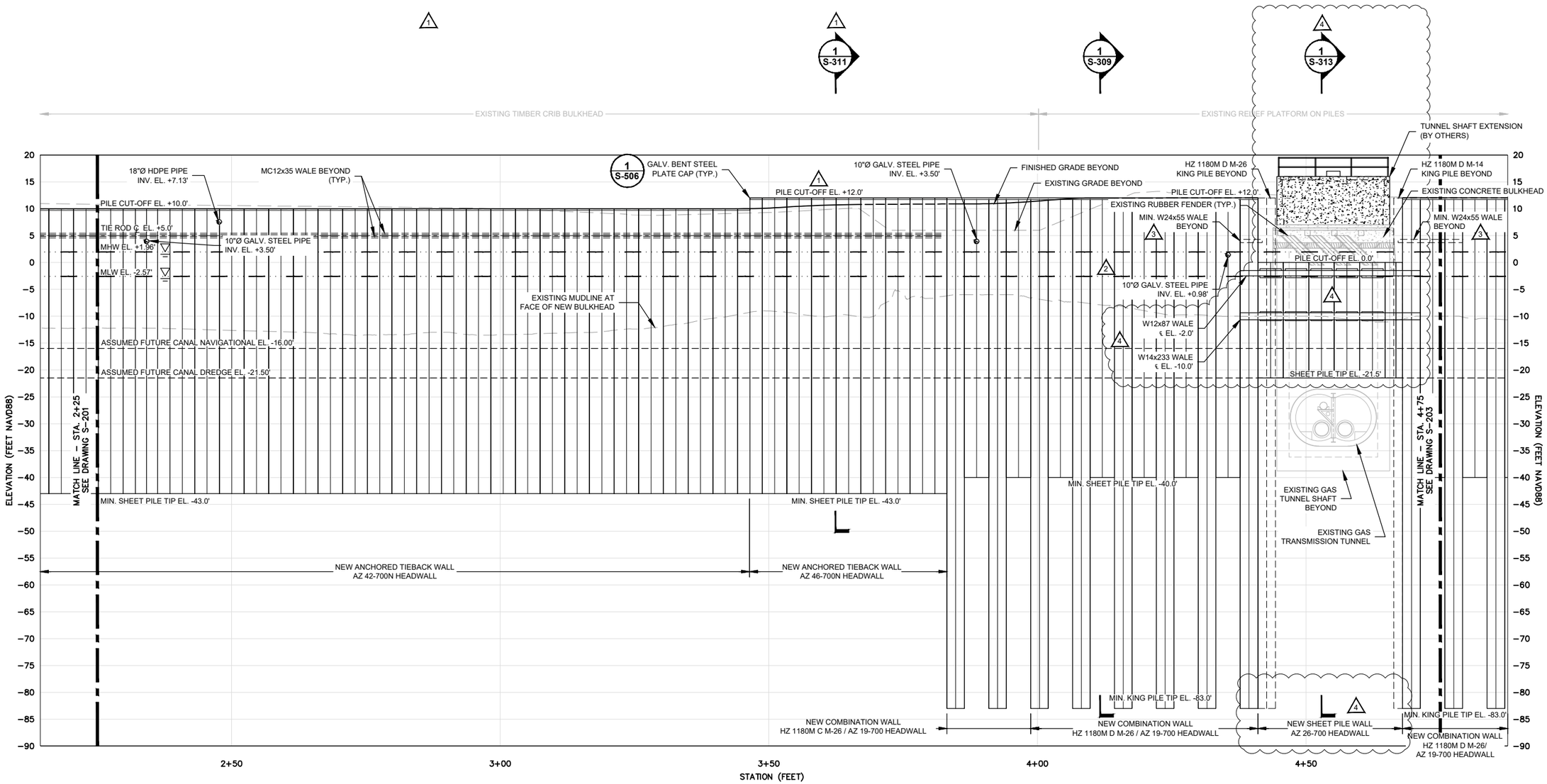
Tel. 315.446.9120

S-105A



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IMAGES:
Arcadis Logo BW_2021.PNG
LAB PE 11.30.17.tiff
LAB PE 2.4.19.tiff
TWY PE 11.30.17.tiff

1"=10' 10' 0 10' 20'
HORIZONTAL AND VERTICAL SCALE

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No.	Date	Revisions	By	Ckd
4	8/13/2021	ADDED NEW CLOSURE WALL AND REVISED PILE	MSG	MJB
		LOCATIONS TO REFLECT AS-BUILT CONDITIONS		
3	11/13/2020	ADDED NEW WALES AT BULKHEAD TERMINATIONS AT	LAB	JRG
		TUNNEL SHAFT		
2	1/10/2020	ADDED NEW PIPE PENETRATION	DGN	MJB
1	2/4/2019	DELETED DUPLICATE SECTION, ADDED NEW SECTION,	RPK	MJB
		& REVISED PILE CUT-OFF EL. FROM CP-25 TO CP-26		

Professional Engineer's Name: TERRY W. YOUNG
Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	11/30/2017	MJB
Designed by	Drawn by	Checked by
RPK	JLH	APC

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BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

BULKHEAD BARRIER WALL PROFILE STA. 2+25 TO STA. 4+75

Arcadis Project No.
B0036728.0001.00003

Date
NOVEMBER 2017

Arcadis
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110 West Fayette Street, Suite 300
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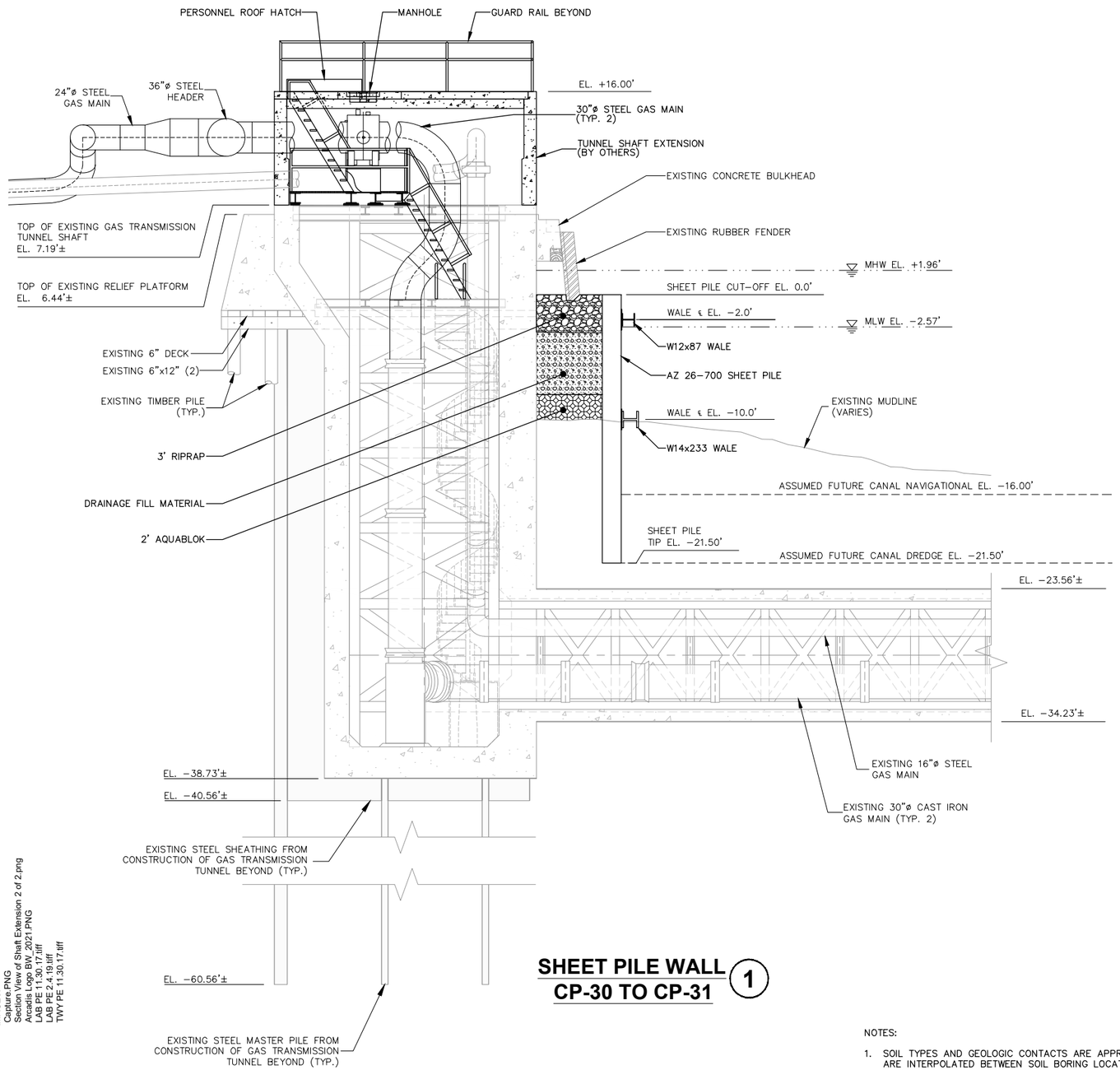
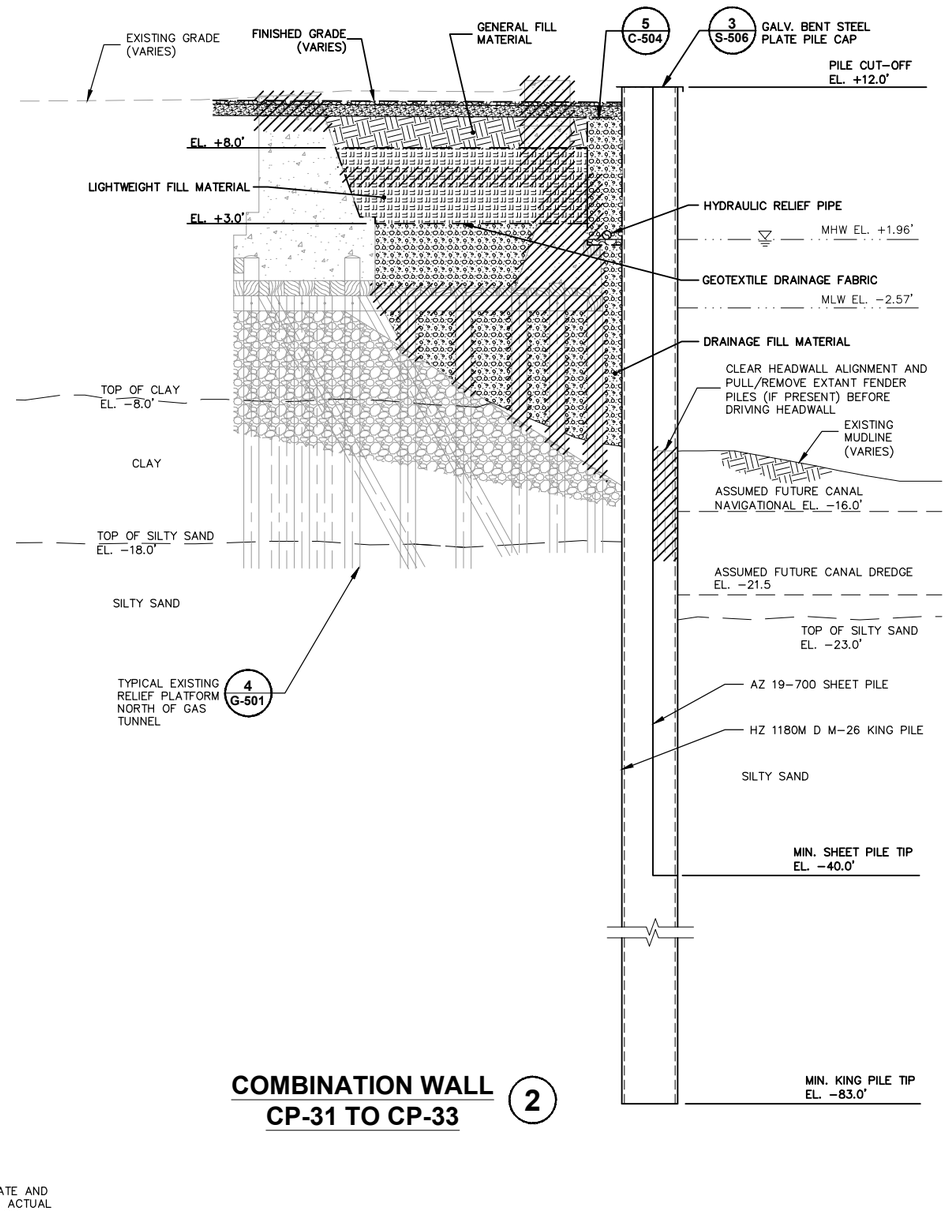
Tel. 315.446.9120

S-202



SHEET PILE WALL CP-30 TO CP-31 (1)



COMBINATION WALL CP-31 TO CP-33 (2)

NOTES:

1. SOIL TYPES AND GEOLOGIC CONTACTS ARE APPROXIMATE AND ARE INTERPOLATED BETWEEN SOIL BORING LOCATIONS. ACTUAL SUBSURFACE CONDITIONS MAY BE DIFFERENT THAN THOSE SHOWN OR INDICATED.
2. ADDITIONAL STRUCTURES AND UNDERGROUND FACILITIES MAY BE PRESENT THAT ARE NOT SHOWN OR INDICATED.

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TWY PE 11.30.17.tiff

XREFS:
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1"=5' (5' 0 5' 10')

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No.	Date	Revisions	By	Ckd

Professional Engineer's Name: TERRY W. YOUNG		
Professional Engineer's No.: 074847		
State: NY	Date Signed: 8/13/2021	Project Mgr.: MJB
Designed by: MSG/LAB	Drawn by: JLH	Checked by: MJB

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BOROUGH OF BROOKLYN, KINGS COUNTY, NEW YORK
SITE REMEDIATION

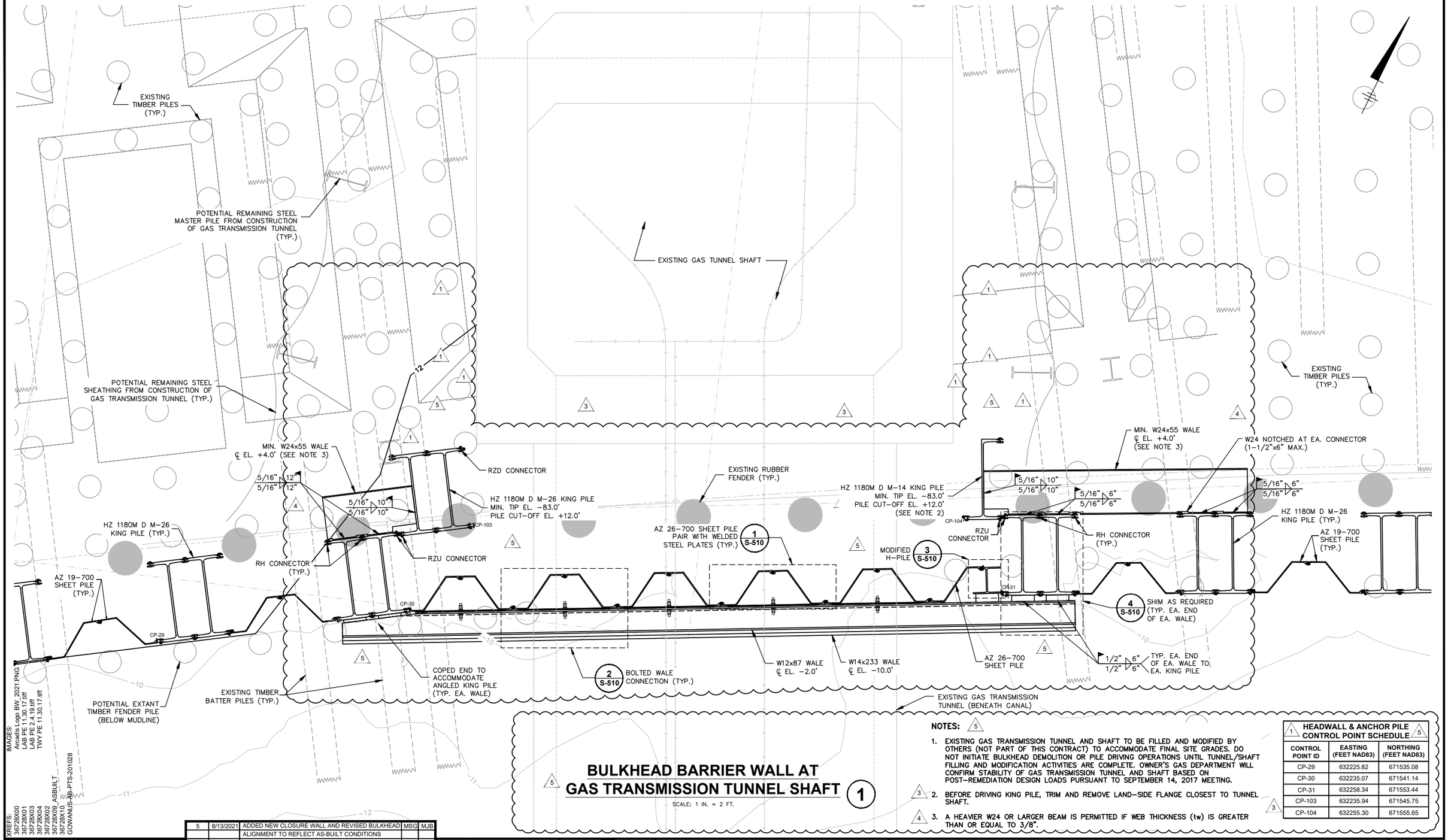
BULKHEAD BARRIER WALL SECTIONS

Arcadis Project No.
B0036728.0001.00003

Date
AUGUST 2021

Arcadis
One Lincoln Center
110 West Fayette Street, Suite 300
Syracuse, NY 13202
Tel. 315.446.9120

S-313



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GOWANUS_AB-PTS-201028

BULKHEAD BARRIER WALL AT GAS TRANSMISSION TUNNEL SHAFT 1

SCALE: 1 IN. = 2 FT.

NOTES: 5

1. EXISTING GAS TRANSMISSION TUNNEL AND SHAFT TO BE FILLED AND MODIFIED BY OTHERS (NOT PART OF THIS CONTRACT) TO ACCOMMODATE FINAL SITE GRADES. DO NOT INITIATE BULKHEAD DEMOLITION OR PILE DRIVING OPERATIONS UNTIL TUNNEL/SHAFT FILLING AND MODIFICATION ACTIVITIES ARE COMPLETE. OWNER'S GAS DEPARTMENT WILL CONFIRM STABILITY OF GAS TRANSMISSION TUNNEL AND SHAFT BASED ON POST-REMEDIATION DESIGN LOADS PURSUANT TO SEPTEMBER 14, 2017 MEETING.
2. BEFORE DRIVING KING PILE, TRIM AND REMOVE LAND-SIDE FLANGE CLOSEST TO TUNNEL SHAFT. 3
3. A HEAVIER W24 OR LARGER BEAM IS PERMITTED IF WEB THICKNESS (tw) IS GREATER THAN OR EQUAL TO 3/8". 4

HEADWALL & ANCHOR PILE CONTROL POINT SCHEDULE 1 5

CONTROL POINT ID	EASTING (FEET NAD83)	NORTHING (FEET NAD83)
CP-29	632225.82	671535.08
CP-30	632235.07	671541.14
CP-31	632258.34	671553.44
CP-103	632235.94	671545.75
CP-104	632255.30	671555.65

1"=2' (2' 0 2' 4')

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No.	Date	Revisions	By	Ckd
5	8/13/2021	ADDED NEW CLOSURE WALL AND REVISED BULKHEAD ALIGNMENT TO REFLECT AS-BUILT CONDITIONS	MSG	MJB
4	11/13/2020	ADDED NEW WALES AT BULKHEAD TERMINATIONS AT TUNNEL SHAFT	LAB	JRG
3	4/13/2020	REVISED BULKHEAD TERMINATION AT TUNNEL SHAFT	DGN	MJB
2	6/19/2019	REVISED KING PILE SECTION LABEL IN RESPONSE TO RFI NO. 1	AJB	MJB
1	3/8/2019	REVISED CONTROL POINT IDS AND COORDINATES	RPK	MJB

Professional Engineer's Name: **TERRY W. YOUNG**
Professional Engineer's No.: 074847

State	Date Signed	Project Mgr.
NY	11/30/2017	MJB
Designed by: RPK	Drawn by: JLH	Checked by: APC

STATE OF NEW YORK · TERRY WILLIAM YOUNG · LICENSED PROFESSIONAL ENGINEER · 074847

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BULKHEAD BARRIER WALL DETAILS

Arcadis Project No.
B0036728.0001.00003

Date
NOVEMBER 2017

Arcadis
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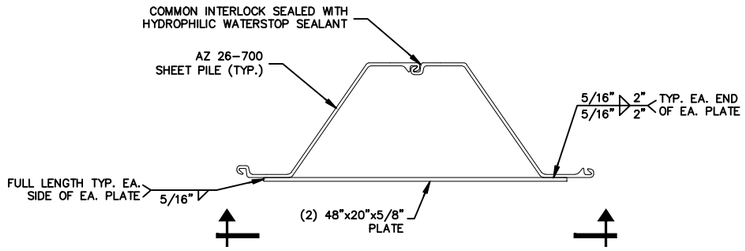
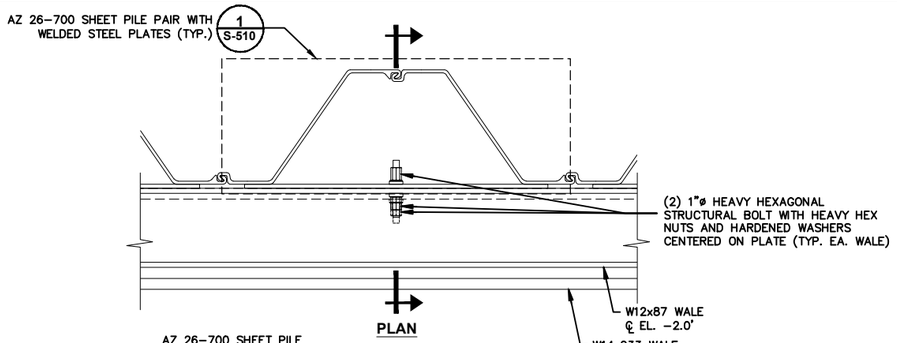
110 West Fayette Street, Suite 300
Syracuse, NY 13202
Tel. 315.446.9120

S-505



PLAN



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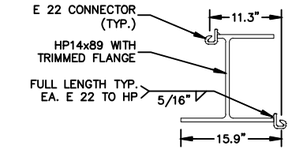


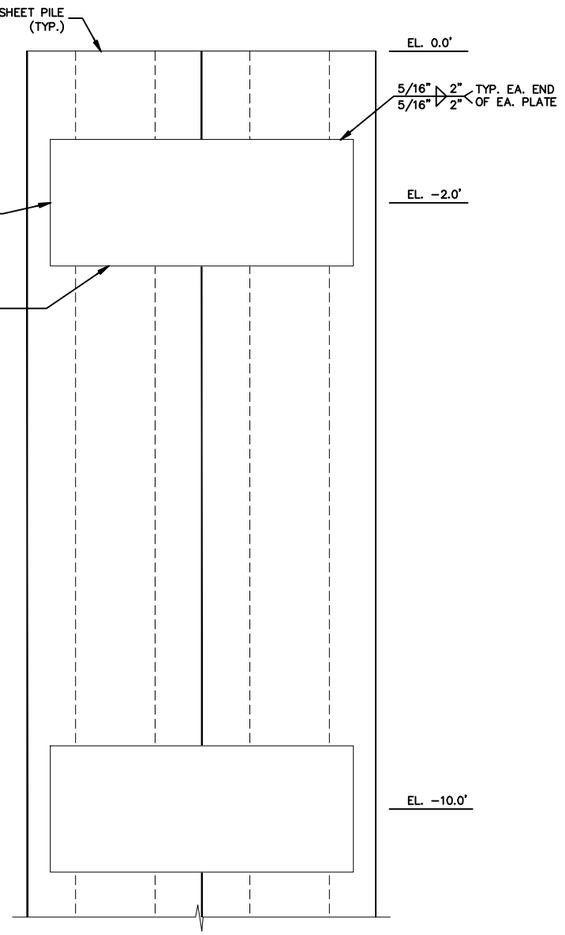
PLAN

NOTE:

1. FIELD-VERIFY ALL DIMENSIONS, INCLUDING DISTANCE BETWEEN INTERLOCKS OF KING PILE AND FINAL SHEET PILE, BEFORE TRIMMING FLANGE AND FABRICATING PILE.

MODIFIED H-PILE 3

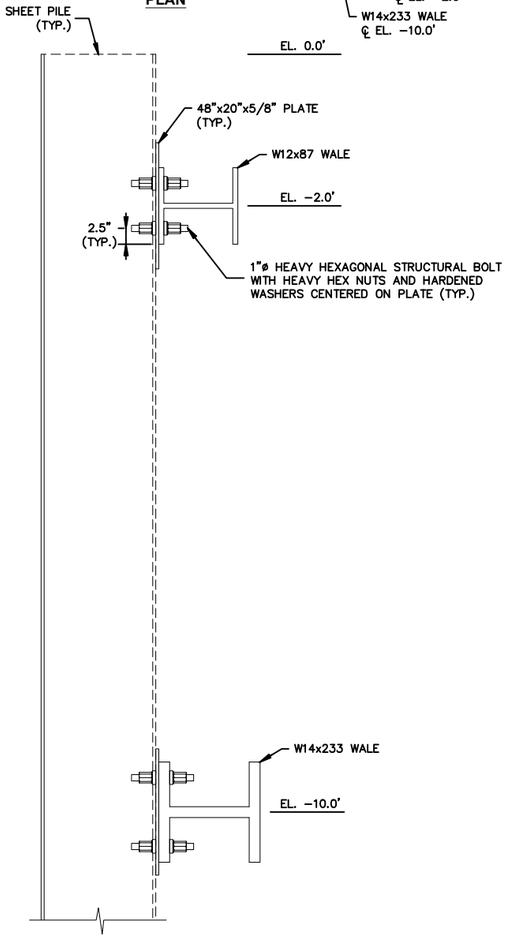
0 1 FT. 2 FT.
SCALE: 1 IN. = 1 FT.



ELEVATION

AZ 26-700 SHEET PILE PAIR WITH WELDED STEEL PLATES 1

0 1 FT. 2 FT.
SCALE: 1 IN. = 1 FT.



SECTION

BOLTED WALE CONNECTION 2

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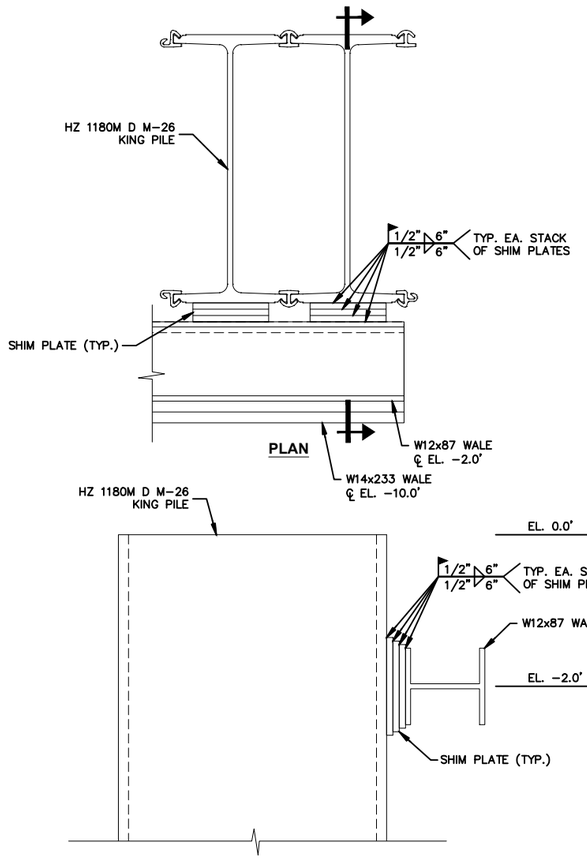
SCALE: 1 IN. = 1 FT.



PLAN

SECTION

TYPICAL SHIM DETAIL FOR WELDED WALE CONNECTIONS 4

0 1 FT. 2 FT.
SCALE: 1 IN. = 1 FT.

IMAGES:
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LAB PE 11.30.17.tiff
LAB PE 2.4.19.tiff
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0 1 FT. 2 FT.
SCALE: 1 IN. = 1 FT.

THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:

USE TO VERIFY FIGURE REPRODUCTION SCALE

No.	Date	Revisions	By	Ckd

Professional Engineer's Name		
LISA A. BOWE		
Professional Engineer's No.		
086254		
State	Date Signed	Project Mgr.
NY	8/13/2021	MJB
Designed by	Drawn by	Checked by
LAB	JLH	MJB

STATE OF NEW YORK · LISA A. BOWE · 086254 · LICENSED PROFESSIONAL ENGINEER

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BULKHEAD BARRIER WALL DETAILS

Arcadis Project No.
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Tel. 315.446.9120

S-510

DRAFT

Hydraulic Relief System Design: Background and Timeline
Former Citizens Gas Works Manufactured Gas Plant Site
Borough of Brooklyn, Kings County, New York
NYSDEC Site Nos. C224012 and C224012B

The primary purpose of the passive hydraulic relief system is to prevent structural damage to or excessive deflection of the bulkhead barrier wall system due to increases in groundwater mounding caused by future activities and conditions unrelated to the Citizens remediation project (e.g., Site development, climate change, etc.). The hydraulic relief system was first included in the *95% Remedial Design Report* (95% RD), which was submitted to NYSDEC (with copy to USEPA) on January 27, 2017. As indicated in Section 3.3.2.1 of that document, the system generally comprised nominal 6-inch diameter perforated high-density polyethylene (HDPE) piping located immediately behind the bulkhead at an average invert elevation of 6.12 feet NAVD88 and five precast concrete manholes. The manholes included internal environmental hoods over the openings for the outlet pipes to help control sheens/floatables. On August 10, 2017, representatives of NYSDEC and USEPA met to discuss the 95% RD. In a follow-up e-mail dated August 14, 2017, USEPA indicated that it did not have any comments on the 95% RD. The *100% Remedial Design Report* (100% RD) was submitted to NYSDEC (with copy to USEPA) on November 30, 2017 and included the same hydraulic relief system design that had been previously included in the 95% RD. The 100% RD was approved by NYSDEC on January 2, 2018.

In July 2019, following the demobilization of Ferrara Brothers Building Materials Corporation, National Grid mobilized to the Site to begin the remediation work. In September 2019, USEPA voiced comments regarding the: (1) elevation of the hydraulic relief piping and Site-wide groundwater mounding; and (2) treatment capabilities of the hydraulic relief manholes. National Grid and USEPA participated in a conference call on October 8, 2019 to discuss USEPA's comments on the hydraulic relief system. In response to the comments voiced by USEPA on that call, National Grid revised the hydraulic relief system design by: (1) lowering the piping by approximately 4 feet (from an average invert elevation of 6.12 feet NAVD88 to an average invert elevation of approximately 2.00 feet NAVD88) in the central portion of the bulkhead barrier wall where the greatest model-predicted groundwater mounding will occur, as well as the remainder of Parcel II where the cantilevered bulkhead barrier wall is being installed; and (2) adding internal vortex-type hydrodynamic separators (water quality/treatment units) to the manholes to more closely align with the function of the oil-water separators being installed at the Fulton MGP site. An additional (sixth) manhole was also added south of the existing gas transmission tunnel shaft on Parcel II of the Site to accommodate the lower piping in that area, which could not be tied into the existing manhole (manhole MH-3) due to the configuration of the hydrodynamic separator within the manhole.

National Grid met with USEPA on November 18, 2019 to go over the proposed changes to the hydraulic relief system and, on December 3, 2019, the revised design drawings and product information/specifications for the proposed hydrodynamic separators (First Defense HC Stormwater Treatment Device, by Hydro International, Ltd.) were transmitted electronically to USEPA for review. On December 9, 2019, National Grid received a response e-mail back from USEPA indicating that USEPA had "concluded that these proposed changes are along the lines that were discussed during our recent meeting and they fully address EPA's comments on the matter." USEPA went on to indicate that it had "no further comments on the engineering drawings." The changes to the hydraulic relief system design were subsequently reflected in the January 13, 2020 Permit Equivalency Application Package for the bulkhead barrier wall, which was approved by USEPA on January 22, 2020, and in *Remedial Design Addendum No. 4*, which was submitted to NYSDEC (with copy to USEPA) on February 23, 2020.